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AVIATION SAFETY LETTER

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*Learn from the mistakes of others;
you'll not live long enough to make them all yourself...*



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The Cycle of Improvement in Aviation Safety

On June 3, 2011, near Bedwell Harbour, B.C., a privately registered Cessna 180 yawed during take-off causing one wing to touch the water, flipping the aircraft and its passengers into the sea.

"The pilot and the only other occupant had read and used Transport Canada's seaplane safety literature," noted the Transportation Safety Board of Canada (TSB) occurrence report. "They were both able to escape with little or no injury."



Gerard McDonald

At Transport Canada (TC), our employees picked up on that line and it was acknowledged that the collaborative work between TC and industry was benefiting Canadians.

Last year, in July, after a floatplane accident, two passengers claimed the only reason they survived was due to the pre-flight safety briefing. C-FAX 1070, one of the highest rated news/talk radio stations in B.C., aired a segment featuring our own Nicole Girard, Director, Policy and Regulatory Services, to discuss the passengers' story and TC's role in the well-being of those passengers.

"That's why Transport Canada recently increased awareness in this regard," said Nicole. "As we've seen, certainly a good pre-flight briefing can help save lives."

The above incidents represent the end-results of the collective efforts of our employees and those at the TSB. Together, our goal is to minimize incident occurrences and maximize survivability in the event that an accident does occur.

That is the reason for the interdependent relationship between TC and the TSB.

It is about real results for Canadians and perpetual progress in transportation safety.

The TC-TSB relationship

TC and the TSB share a common goal: maintaining and improving transportation safety for Canadians.

The TSB investigates air, marine, rail and pipeline incidents. From these investigations, the TSB identifies causes and recommends improvements to avoid future occurrences. TC uses these recommendations and data from other sources to determine ways to strengthen the aviation safety program.

On March 16, 2010, the TSB released a watchlist of safety recommendations to enhance the safety of transportation. On that watchlist, the TSB highlighted the risk of aircraft under crew control colliding with land and water.

Not long after, the Minister of Transport, Infrastructure and Communities committed a series of initiatives aimed not only at preventing the type of accident that caused the Cessna to collide with the water, but also at improving a passenger's chances of surviving.

In June of that year, our Civil Aviation employees launched a floatplane safety awareness campaign for passengers and commercial operators. Through this campaign, our employees produced the floatplane safety literature that the pilot and passenger of the Cessna noted reading before takeoff.

This cycle—from the initial TSB recommendation to the work of our employees to the implementation of floatplane safety initiatives—represents the process whereby together we enhance aviation safety in Canada. It is how we realize our shared vision of an improving, evolving transportation safety system for Canadians.

TC is also in the final stages of implementing regulations that would require the installation and operation of Terrain Awareness Warning Systems in commercial air taxi, commuter and airline operations. If implemented, this would drastically reduce the risk of aircraft under crew control colliding with land or water.

How we intend to make the TC-TSB relationship stronger

In the next year, TC is moving to modernize our process to respond to TSB recommendations. Our consultative, transparent approach to rulemaking is one of the best. Yet, this process needs to be quicker. We want to speed up the recommendation-consultation-action cycle, thereby implementing safety initiatives at a much quicker rate and potentially avoiding would-be accidents.

When this process is complete, we aim for our rulemaking process to be more efficient, more effective and more responsive to safety priorities. We will do this by bringing together the right people at the right time on the right issues through a focus group. This group will then determine the best course of action for a given TSB recommendation. The proposed actions of the focus group will then be put to the larger aviation community.

This model is being tested for a set of recommendations released by the TSB in February, 2011.

A closer look at TC's rulemaking modernization project

On 12 March, 2009, a Sikorsky S-92A on a flight to the Hibernia oil rig struck the water at a high rate of descent after it had a total loss of oil in the transmission's main gear box. Two years later, the TSB concluded its investigation and released its accident report, which contained four recommendations to enhance safety.

This summer, TC created a small, specialized group of stakeholders directly involved in offshore helicopter operations to review the TSB's recommendations. The group will produce a complete package of proposed actions. If a proposed action requires a rule change, TC will consult the larger aviation community.

At the Leading Edge of Aviation Safety

Our business is risk management. We are in the business of percentages. An accident is the result of a single factor or a combination of factors, usually the latter. These factors increase the risk of an incident occurring. Therefore, our mandate is to seek out those contributory factors and eliminate them, thereby reducing the chance of an adverse incident. TSB recommendations support this process. TSB investigations outline the sources of risk; we put the regulatory framework and the oversight structure in place to eliminate those risks.

That is how we manage risks, manage percentages and advance aviation safety.

Canada has one of the safest aviation systems in the world. Together, TC, the TSB and you can make it even better.



Gerard McDonald
Assistant Deputy Minister, Safety and Security
Transport Canada, Civil Aviation

2011-2012 Ground Icing Operations Update

In July 2011, the Winter 2011-2012 *Holdover Time (HOT) Guidelines* were published by Transport Canada. As per previous years, TP 14052, *Guidelines for Aircraft Ground Icing Operations*, should be used in conjunction with the *HOT Guidelines*. Both documents are available for download at the following Transport Canada Web site: www.tc.gc.ca/eng/civilaviation/standards/commerce-holdovertime-menu-1877.htm.

If you have any questions or comments regarding the above, please contact Doug Ingold at douglas.ingold@tc.gc.ca.



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Update: Floatplane Operators Association of British Columbia

by Lyle Soetaert, President, Floatplane Operators Association of British Columbia

The Floatplane Operators Association of British Columbia (FOA) is up and running! Our status as a not-for-profit organization was approved in early March 2011, and we held our first annual general meeting on April 12, 2011. Our mandate is to establish best practices, together with a consistent culture of safety across the industry. The successful launch is due to the tremendous support we have received from the industry, Transport Canada (TC) and the Transportation Safety Board of Canada.

Our members consist of all commercial floatplane operators in the province, organizations with a vested interest in the B.C. floatplane industry (associate members), and individuals from across the province. Our elected board of nine members represents all sizes of operators and the entire geography of B.C. floatplane activity. Additionally, one of the board members represents our associate members with full input with respect to discussions and decision-making processes. We are proud to announce that our associate members elected Viking Air Ltd. of Victoria, B.C., to hold this position.

As with any new organization, we need to "put the rubber to the road" and demonstrate value to our members. So, what have we been doing? Our first order of business was to establish several committees to perform research and provide recommendations to the board. We immediately formed our Safety Committee and charged it with investigating options and recommending best practices for the use of life preservers by our passengers. We are very happy to report that the committee came back with several options, all of which meet the existing standards and can be readily adopted by our members (*details can be found on our Web site, please see below*). The committee is continuing to work on this issue and is improving on the existing recommendations to ensure our passengers' safety.

We have also been very busy connecting with similar organizations both here and in the United States, and with our partners in government. We attended the Federal Aviation Administration (FAA)-TC Cross Border Aviation Summit in Anchorage, AK, which was the first time the B.C. floatplane industry was represented at this meeting. We were able to share best practices with our northern cousins and discuss similar safety and



Viking Air Ltd. provided this Beaver door mounted with a popout emergency exit window.

operational issues. We made contact with the Medallion Foundation of Alaska and have begun discussing how our organizations can collaborate to reduce aviation accidents and improve safety.

We then participated in the Civil Aviation Safety Officer Partnership sponsored by NAV CANADA. Operators, airport managers, and NAV CANADA specialists gathered to share safety information and discuss methods of improvement. Our participation brought forward industry concerns regarding webcam placement and usage, wake turbulence concerns around airports, and our ability to provide feedback about proposed changes. The forum was very productive; we now have input regarding issues directly affecting us and we have regular contact with NAV CANADA.


As the word about us spread, the Air Transport Association of Canada (ATAC) invited us to participate in their Special Flight Operations Committee meeting to establish a position on the work of the Transport Canada Flight Duty Times & Fatigue Management Working Group. We were able to provide a different perspective as 703 and 704 operators, and we voiced our concerns with respect to this very important issue, which continues to be examined. Following this meeting, we attended ATAC's Industry Symposium on Regulatory Services. Our

concerns joined our industry partners' concerns regarding the level of service supplied by the regulator.

Last, but definitely not least, we attended the Civil Aviation Executives Safety Network meeting sponsored by TC. Over 100 individuals from across all aspects of aviation and aerospace were in attendance. The subject, "Leading for Tomorrow: Setting the Course for Aviation in Canada", involved a remarkable discussion on how the aviation industry and TC can work together to ensure a vibrant and sustainable future. We brought forward our unique industry concerns and helped develop priorities for TC and the aviation and aerospace sector.

The information shared and the personal contacts forged at these events are invaluable. We are working diligently to foster more relationships and expand our ability to make commercial passenger floatplane travel the safest it

can be. We will continue to provide added value to all our members and to the travelling public. We are in the midst of a membership drive and encourage all interested parties to contact us. The Board is energized and focused on developing a successful and leading organization devoted to commercial floatplane safety. Please see our Web site below or contact us directly for further information. We would also like to thank the British Columbia Aviation Council for the support they have given us and the partnership we are developing. We look forward to serving you on the waters of B.C.!

Contact info:
Floatplane Operators Association of British Columbia
PO Box 32366, YVR Domestic Terminal RPO
Richmond, BC V7B 1W2
www.floatplaneoperators.org 

COPA Corner: Flying is Fun, Flying an Ice Cube is Not

by Dale Nielsen. This article was originally published in the "Chock to Chock" column of the October 2009 issue of COPA Flight, and is reprinted with permission.

Like it or not, colder weather is coming and airframe icing doesn't just happen to IFR aircraft flying in cloud. It has happened to me in clear air with the cloud cover at least 3 000 ft above me, and it could happen to you.

I was flying a C-170 with a student in the practice area in late October when it started to rain. The rain froze all over our aircraft. We descended and turned back to the airport. The ice continued to build until we were about 4 mi. from landing when the rain stopped.

We were flying under a winter warm front where the air above us was above freezing and the air we were flying in was below freezing, giving us freezing rain.



This ice was mixed ice (rime and clear) and added considerable weight to the aircraft as well as considerable drag. Also, our windshield was covered with ice reducing forward visibility to zero.

Winter Warm Front

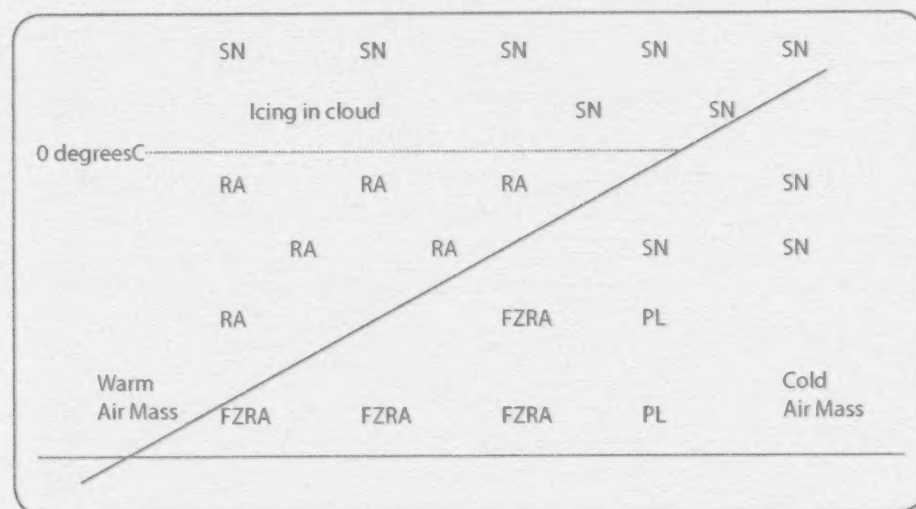


Figure 1

Airframe icing can occur any time there is an inversion and you are flying in cold air below warmer air aloft and there is cloud above you.

Rime ice is formed by small water droplets that freeze on contact without spreading, making it look opaque, milky and rough. As it occurs, it disrupts the airflow, causing an immediate loss of lift. Fortunately, it easy to see as it forms.

Clear ice is formed from very large super cooled droplets that spread out on impact making a glassy heavy coating over the

leading edge of aircraft surfaces and a fair distance back over the upper surface of the wing. Clear ice is heavy and very hard to see forming. It eventually also changes the shape of the wing causing a loss of lift and an increase in drag.

When airframe icing is encountered, it is imperative to leave the area immediately and select pitot heat and cabin or windshield heat "on." If it is possible to descend to warmer air, do so and the ice will melt off quickly. If it is not possible to descend, turn around to leave the area. With luck the icing will melt off. In my case, luck was not with us. We remained in cold air and the ice was too thick for the cabin heat to melt.

The Cessna Supplement for light Cessna aircraft suggests that if visibility is impaired, perform a forward slip to gain better visibility. It also states that the approach should be flapless at 70 mph. Piper has no recommendations for flight with airframe icing and other light aircraft manufacturers may not have any advice either.

I would be careful about slipping with airframe icing. Drag has already been increased by an unknown amount. A forward slip is normally performed to increase drag to lose altitude. Do we really want to increase drag any more at this point? Even with an increase in power to maintain airspeed we may possibly stall at the approach speed.

A 70 mph approach with the flaps up may not be enough. An experience in the Air Force taught me that an aircraft may stall at an airspeed 20 kt above the normal indicated stall speed. This would not leave much margin at 70 mph with the flaps up.

If it is possible to open a side window or slide the canopy back a little, you may be able to scrape enough ice from the windshield to see ahead. I was not able to scrape enough ice off the windshield to see ahead so I flew a little to one side of the approach path and leaned my

head as far to the left as possible. This enabled me to see enough to perform an approach. As I approached the runway, I moved the aircraft left and used my peripheral vision to stay in the centre of the runway.

I flew the approach at 80 mph with the flaps up. I had 5 000 ft of runway and I did not want to even think about a stall.

Lowering the flaps changes the camber and angle of attack of the wing. This change in angle of attack with ice on the wing could precipitate an immediate stall.

I flew the aircraft onto the runway, raising the nose of the aircraft only enough to avoid landing nose wheel first. I reduced the power very slowly and just enough to get the aircraft to land and then I reduced the power to idle. Flaring the aircraft for landing may increase the angle of attack of the wings to beyond the critical angle of attack with the ice build-up. A rapid power reduction as the aircraft nears the ground may also precipitate a stall.

If you are landing on a short or icy runway, you may have to modify this procedure some, but carefully. It is better to use all of the runway or even go off the end rather than stall short of or over the runway.

Watch for and try to avoid flying under a winter warm front or inversion with a cloud cover. At the first sign of airframe icing, get away from it. Flying is supposed to be fun. Flying an ice cube is not.

Dale Nielsen is an ex-Armed Forces pilot and aerial photography pilot. He lives in Abbotsford, B.C., and currently flies MEDEVACs from Victoria in a Lear 25. Nielsen is also the author of seven flight training manuals published by Canuck West Holdings. Dale can be contacted via e-mail: dale@flighttrainingmanuals.com. To know more about COPA, visit www.copanational.org. Δ

Reducing the Risk of Runway Excursions

by Monica Mullane, Performance Indicators Analyst, NAV CANADA

The Flight Safety Foundation's May 2009 Report on the Runway Safety Initiative entitled "Reducing the Risk of Runway Excursions" reported that from 1995 to 2008:

- commercial transport aircraft were involved in 1 429 accidents,
- 30 percent (431) occurred on runways, and
- 97 percent of these were runway excursions.

A runway excursion occurs when an aircraft fails to confine its takeoff or landing to the designated runway.

This may result from the aircraft undershooting or over-running the runway during landing, the aircraft failing to become airborne in the available runway during takeoff or a loss of directional control during takeoff or landing.

The Air France accident at Toronto's Pearson International Airport in August 2005 and the Antonov incident at the Windsor airport in December 2000 are examples of runway excursions in Canada.



Although runway incursions have been identified as an aviation safety risk for many years, runway excursions have not received the same attention. For example, in 1999 a joint subcommittee of Transport Canada and NAV CANADA was formed and made recommendations for the prevention of runway incursions and improving runway safety. Runway excursions were not discussed in the final report, TP 13795.

Canadian statistics

The following charts show the situation with respect to Canadian runway excursions and incursions, as identified

through the NAV CANADA Aviation Occurrence Reporting process. Unlike the figures mentioned earlier for commercial aircraft accidents, the charts below include all types of aircraft in all types of operation from private to commercial. In addition, some of the excursions do not meet the definition of an aviation accident.

The first chart compares runway excursions with runway incursions for the past ten years.

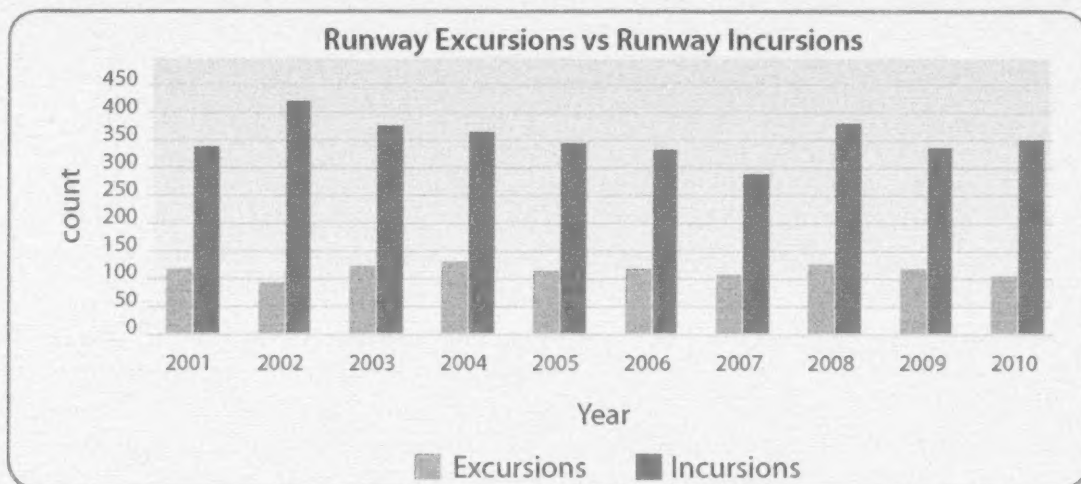


Chart 1. Canadian Runway Excursions and Incursions

The second chart compares the type of Runway Excursions observed in 2010. Given that this data contains all types of operation and not just accidents, it is not surprising that the pattern is somewhat different from

the worldwide statistics. The Flight Safety Foundation's May 2009 Report showed roughly equal number of veer-offs and overruns.

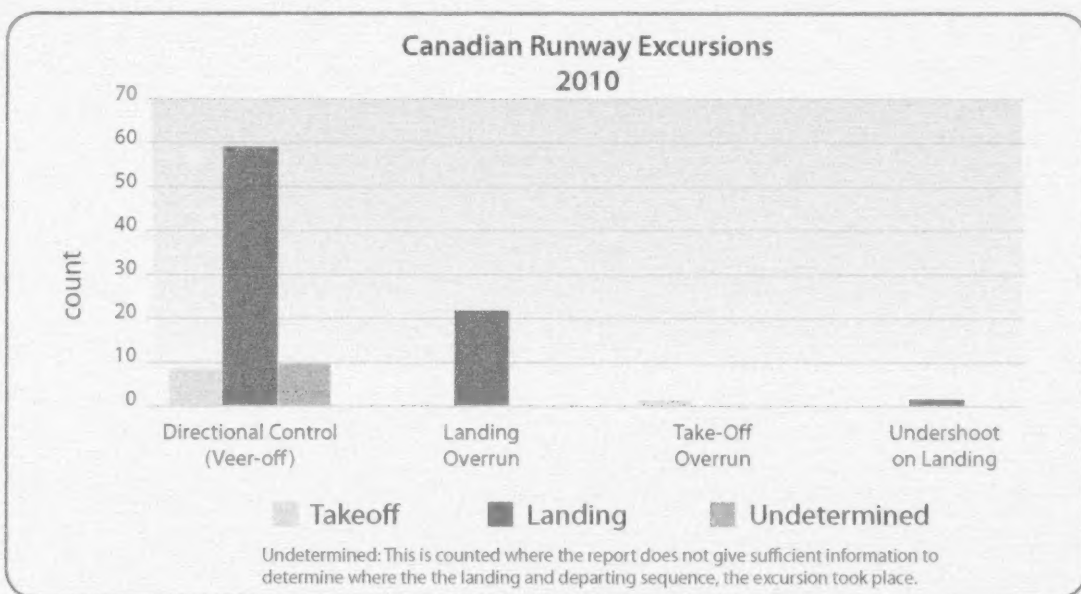


Chart 2. Breakout of Canadian Runway Excursions for 2010

Actions to address

The Flight Safety Foundation report identified the role of five groups in helping to reduce the risk of runway excursions: Flight Operations, Air Traffic Management, Airports, Aircraft Manufacturers, and Regulators.

For air operators, the Flight Safety Foundation's top four recommendations were:

- stabilized approach criteria;
- true "no fault" go-around policy;
- training for crew in handling the excursion risk factors; and
- policies, procedures and knowledge to assist decision-making in the cockpit.

NAV CANADA's role in reducing the risk of runway excursions lies in two main areas:

- by providing air traffic services that allow flight crews to fly a stabilized approach, and;
- by NAV CANADA procedures that require both controllers and specialists to provide current Runway Surface Condition (RSC) and Canadian Runway Friction Index (CRFI) reports to arriving and departing aircraft, allowing flight crews to make informed decisions.

NAV CANADA has expanded the Runway Safety Web site to include information on runway excursions – visit the site at www.navcanada.ca.

NAV CANADA has an information exchange with safety officers of airlines to improve safety. One question raised was why conditions upon landing appeared to differ from those expected based on the pilot's understanding of the Runway Surface Condition (RSC) report. There

are limitations to the RSC reports and these must be taken into consideration as you plan your approach and landing. The European Aviation Safety Agency – EASO 2008-4 reports:

"The amount and type of RCR [runway condition reports] information varies between countries and even airports themselves. A major matter of concern is that lack of harmonization leads to surface condition information provided by airports to air carriers and aviators, especially for operational reporting, being generated using a variety of inspection methods and friction measurement procedures without uniform quality standards. Airplane manufacturers and air carriers, therefore, have a limited ability to provide precise airplane landing and take-off performance instructions to pilots for contaminated runways. This in turn may lead to greater than necessary safety margins which financially penalize operators through operational limitations, or it may lead to misinterpretation of condition reports resulting in compromised safety."

Current efforts in Canada and internationally are focused on standardizing runway surface report information.

Runway excursions are an industry challenge, requiring coordination and cooperation at the local, national and international levels. All industry stakeholders described in the Flight Safety Foundation report have a responsibility to implement mitigations that will ensure a safe landing or departure. Δ

Fuel Cargo System in a Canadian Aircraft

by Roger Lessard, Civil Aviation Safety Inspector, Dangerous Goods Standards, Standards, Civil Aviation, Transport Canada

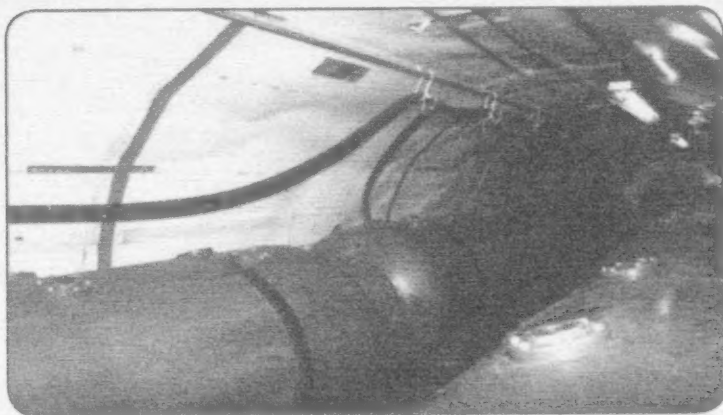
During a Program Validation Inspection, a Civil Aviation Safety Inspector–Dangerous Goods (CASI-DG) discovered that an air operator, with a valid Air Operator Certificate (AOC) issued in the Prairie and Northern Region, was using an aircraft to carry dangerous goods in large means of containment without the appropriate dangerous goods procedures and training program approvals. The aircraft was issued a Supplemental Type Certificate (STC) for a fuel cargo system in an existing Class E cargo compartment from the Ontario Region. The system consists of twelve (12) fuel tanks each capable of containing 202 U.S. gal (approximately 780 litres (L) each).

Transport Canada published Advisory Circular (AC) 500-013 – Carriage of Bulk Liquids in Aircraft, Issue 01, in 2004. This AC summarizes the criteria for

the certification of design and installation of systems for the carriage of bulk liquids in aircraft, including liquids classified as dangerous goods. The AC is available online at: www.tc.gc.ca/eng/civilaviation/certification/guidance-500-500-013-899.htm.

With respect to the fuel cargo systems, Section 5.0 of the AC indicates that in addition to the criteria set out in this AC, bulk liquids carriage systems designed for the transportation of liquids classified as dangerous goods must comply with the requirements of the *Transportation of Dangerous Goods Regulations*. It makes no reference to the *Canadian Aviation Regulations* (CARs) Part VII Commercial Air Services, Division IX, Manuals, Requirements Relating to Company Operations Manuals.

Section 9.3 of the AC indicates that each operating limitation resulting from the installation of bulk liquids carriage system on an aircraft and any additional information necessary for safe operation must be developed and included in a Flight Manual Supplement (FMS). For the carriage of liquids classified as dangerous goods, the FMS must restrict the operation of the aircraft to essential crew only, with no passenger permitted.



TDG Regulations

The handling, offering for transport, or transporting dangerous goods to, from or within Canada must be in compliance with the *Transportation of Dangerous Goods Regulations* (TDG Regulations), Part 12 and the *ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air* (ICAO TI). They provide for the classification, packaging, documentation, safety marks, and training requirements. The TDG Regulations use the term means of containment (MOC) rather than packaging. A small MOC is an MOC with a capacity less than or equal to 450 L, whereas a large MOC is an MOC with a capacity greater than 450 L.

Each one of the fuel tanks installed under the STC is a large MOC. Large MOCs containing 3 000 L or less are called Intermediate Bulk Containers (IBC). However, the ICAO TI prohibits the transport of flammable

liquids in large MOCs, including IBCs, by air unless the State Authority provides a domestic exemption. Such an exemption is provided for the aircraft fuel tank used for the propulsion of the aircraft.

In Canada, section 12.9 of the TDG Regulations provides a domestic exemption to air operators holding a valid AOC under the CARs Part VII, Subpart 2, 3 or 4, or CARs Part 6, Subpart 4 for the transport of specific Class 3 Flammable Liquids. Subsection 12.9(5) states:

“When the Class 3, Flammable Liquids...are contained in a large means of containment, that large means of containment must be...a tank, a container or an apparatus that is an integral part of the aircraft or that is attached to the aircraft in accordance with the Certificate of Airworthiness issued under the *Canadian Aviation Regulations*.”

Section 12.12 of the TDG Regulations provides a similar exemption for all liquid dangerous goods that are used or are to be used at the location where aerial work activities are conducted.

An air operator holding a valid AOC issued under CARs Part VII, Subpart 2, 3 or 4, can transport dangerous goods in a fuel cargo system in compliance with the TDG Regulations, section 12.9 or 12.12. The air operator must submit for review and approval procedures for the carriage of dangerous goods part of the Company Operations Manual, and the corresponding dangerous goods training program. An air operator holding a Private Operator Certificate issued under CARs Part VI, Subpart 4 needs to comply with Section 12.9 of the TDG Regulations.

In all other instances, the transport of dangerous goods by air in large MOCs is prohibited. The transport of dangerous goods by air in large MOCs (including an IBC) may be permitted under an Equivalency Certificate (EC) under Part 14 of the TDG Regulations. Δ

NOTICE: *Instrument Procedures Manual* (TP2076)

The *Instrument Procedures Manual* (TP2076) is no longer produced by Transport Canada. The rights to the book have been assigned to Aviation Publishers (www.aviationpublishers.com), the same people who produce *From the Ground Up*. Trainers and students will be happy to know that Aviation Publishers has updated the *Instrument Procedures Manual* and released it for sale. The *Instrument Procedures Manual* is now available from commercial booksellers.



FLIGHT OPERATIONS

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CFIT in Algonquin Park: a "Get-Home Itis" Case Study?

The following is a condensed version of Transportation Safety Board of Canada (TSB) Final Report A0900217, relating to the tragic aviation accident, which happened to a family going home in a private aircraft, with an inexperienced pilot, in deteriorating night-VFR weather conditions, and over featureless terrain. There is so much to learn in this report alone. The full report is available on the TSB website at www.tsb.gc.ca.

Summary

On October 10, 2009, a Piper PA-28R-180 aircraft departed Kingston, Ont., at 18:27 EDT on a night visual flight rules (VFR) flight to Sudbury, Ont. On board the aircraft were the pilot and three passengers. The estimated time of arrival at Sudbury was 20:42. At 20:52, an emergency locator transmitter (ELT) signal was reported by an overflying aircraft. The aircraft was located the following day at 03:02, approximately 22 SM east of South River, Ont. All four occupants were fatally injured.



On the day of the occurrence, the pilot contacted the London Flight Information Centre (FIC) to obtain a weather briefing for a VFR flight from Sudbury to Kingston, with a view to returning to Sudbury in the evening. During the briefing, the pilot was informed that a cold front was moving in from the west, extending north to south, and would reach Sudbury at approximately 20:00. Ahead of the front, the forecast was for showers and a ceiling of 3 000 ft ASL. As the briefing continued, the pilot was advised that if the arrival in Sudbury was before dark, the weather would remain suitable for a VFR flight. However, after dark, the forecast called for isolated, towering cumulus clouds and a visibility of 3 mi. in light snow showers. In Sudbury, the sunset was to be at 18:47 and twilight at 19:17. At 11:32, the pilot contacted the London FIC for a second time, filed a flight plan for Kingston and also obtained an updated weather forecast for

the return flight to Sudbury. The aircraft departed Sudbury at 12:08 and arrived in Kingston at 13:57.

At 16:55, the pilot phoned the London FIC to obtain a weather briefing for the return flight from Kingston to Sudbury. The pilot planned on departing Kingston at 18:00, with an estimated time of arrival in Sudbury between 20:00 and 20:30. At 17:55, the pilot placed a second call to the London FIC to file a VFR flight plan. The flight plan indicated that it was to be a VFR flight direct to Sudbury, with airspeed of 135 kt and a time en route of 2 hr and 15 min. The estimated time of arrival in Sudbury was 20:42, with 3.5 hr of fuel on board. The aircraft departed Kingston at 18:27. The last radio contact occurred as the aircraft was leaving the Kingston control zone.

The Montréal Area Control Centre (ACC) radar recorded the first 30 min of the flight, and its last radar hit recorded was at 18:52. The aircraft was on a direct track to Sudbury at 3 000 ft ASL.

The aircraft first appeared on the North Bay radar at 19:37. It was approximately 30 NM north of the direct track to Sudbury and at 2 400 ft ASL. The last radar contact occurred at 19:41. The aircraft was approximately 3 NM south east of the accident site at 2 100 ft ASL. During the last 4 min of radar coverage, there were several heading changes, mainly from westerly to northwesterly in direction.

The aircraft was located on October 11, at 03:02 near the western boundary of Algonquin Park, in hilly terrain with ground elevations up to 1 750 ft ASL. The hills were covered with 80- to 100-foot tall hardwood trees. The main wreckage was located approximately at the mid-point of a tree covered hill, at an elevation of 1 660 ft ASL. The aircraft was at a near-level altitude when it began to strike the tops of trees, which were located at the base of a gully prior to rising terrain.

The aircraft was certified, equipped and maintained in accordance with existing regulations and approved procedures. Navigation equipment included a Garmin

GPSMAP 696. This model offered the satellite weather option (subject to a 15 min delay) as well as a terrain/moving map feature. Damage to the GPS unit precluded the downloading of data. It is therefore unknown whether these features were used.

The pilot held a valid private pilot licence for single engine land and seaplanes. The last pilot logbook entry was dated 23 August 2009. The pilot had accumulated 205.4 hr of total time, broken down as follows:

Day/Dual	Day/PIC	Night/Dual	Night/PIC
102.8	79.9	17.2	5.5

The pilot had completed the required training and applied for a night rating; however, there were no records to indicate that Transport Canada had received the application. A rating had not been issued either. Part of this night training included a night time cross-country flight from Sudbury to Kingston with an instructor. This was done on June 5, 2009, which was the last time the pilot had flown at night prior to the accident. Based on logbook entries, this occurrence was to be the pilot's first night time cross-country flight as pilot-in-command. The pilot did not hold an instrument flight rules (IFR) rating.

Weather information

At 16:55, the pilot phoned the London FIC to confirm if the forecast weather for Sudbury had improved. The London FIC provided information derived from the Graphical Area Forecast (GFA) for the Ontario/Quebec region at 13:41, which was valid for use from 20:00 onward (see Figure 1).

A cold front stretching from east of Sault Ste. Marie northward to Timmins was the major meteorological influence.

East of the cold front, in the area stretching from Algonquin Park southeast toward Kingston, the GFA was forecasting:

- scattered clouds based at 4 000 ft, with tops between 6 000 and 7 000 ft ASL; and
- visibility of more than 6 mi.

Immediately east of the cold front, the GFA was forecasting the following:

- ceilings of 800 ft AGL;
- visibility of 4 SM in light rain showers and mist;
- scattered, towering cumulus clouds with tops at 18 000 ft ASL; and
- intermittent visibilities from 5 to more than 6 SM in light rain and mist.

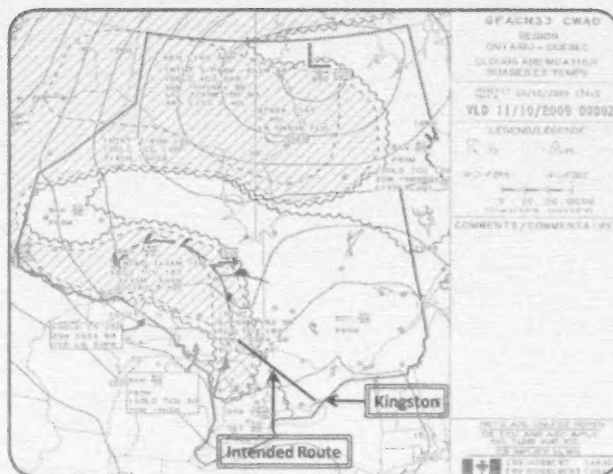


Figure 1. GFA showing intended route and point of departure. Destination is end of line.

Immediately west of the cold front, the GFA was calling for:

- ceilings of 500 ft AGL;
- visibility of $\frac{3}{4}$ SM in light snow showers;
- scattered, towering cumulus clouds with tops at 18 000 ft ASL;
- intermittent visibilities from 3 to 6 SM in light snow; and
- layer of broken cloud based at 3 000 ft ASL and topped at 16 000 ft ASL.

Further west, the GFA called for:

- visibilities of 3 SM in light snow showers;
- isolated, towering cumulus clouds topped at 8 000 ft ASL;
- elsewhere visibilities greater than 6 SM; and
- broken cloud layer based at 3 000 ft ASL and topped at 8 000 ft ASL.

The cold front was moving east at 30 kt, doubling in speed from the previous GFA. It was estimated to arrive in the Sudbury area at about the same time as the flight. The cold front had passed Sault Ste. Marie earlier. The ceiling was recorded as 800 ft AGL, with a visibility of 3 SM in snow showers.

The pilot and the London FIC discussed departing Kingston to arrive in Sudbury before the front moved in and considered North Bay as an alternate destination, which was 59 NM to the east of Sudbury.

At 17:55, the pilot placed a second call to the London FIC to file a VFR flight plan. When asked if weather or other information was needed, the pilot referred to the previously obtained briefing. Having already acquired weather information and made the decision to undertake

the flight, the pilot inquired about any changes for Sudbury. Information derived from the Sudbury terminal aerodrome forecast (TAF) and weather radar was provided.

The TAF for Sudbury, within the timeframe of the flight, was as follows:

- from 18:00, wind 220° true at 12 kt gusting 22, visibility of greater than 6 SM and cloud at 5 000 ft broken; and
- temporarily from 18:00 to 22:00, visibility of 5 SM with light rain showers and mist, as well as a broken cloud layer at 20:00.

The weather radar at Sudbury displayed weak returns toward the west, indicating isolated rain showers. The London FIC also provided abbreviated weather reports for Gore Bay and a variety of airports to the west of Sudbury. The London FIC indicated that the weather conditions for Sudbury, at the time of arrival, were forecast to be favourable and that any precipitations would be very light.

The NAV CANADA Flight Services Manual of Operations (FS MANOPS) requires flight service specialists to acquire insight into a pilot's intentions and requirements, as well as provide the necessary related briefings. The pilot did not request the aviation routine weather reports (METAR) or special reports (SPECI) in full for various stations near the route of flight, including reported altimeter settings and winds aloft. Paragraph 305.4E of the FS MANOPS requires flight service specialists to provide "details of surface weather observations, aerodrome forecast, forecast winds and temperatures." However, the specialist has the discretion to provide additional weather information, even if it may not be entirely consistent with the pilot's stated requirements; no additional information was provided.

At the time of the occurrence, the weather in the vicinity of the accident included a mixture of rain and snow, as well as gusting wind conditions, estimated to be in excess of 25 kt.

Route information

The pilot planned a direct route from Kingston to Sudbury. Initial radar returns indicate that the pilot was following the planned route and with such precision as to suggest the on board GPS was used as the primary navigational aid. The flight departed Kingston at 18:27. Civil twilight for the Kingston area was calculated to end at 18:59. With the exception of the first 32 min, the flight was conducted at night.

The selected route took the aircraft over terrain that provided fewer and fewer features as the flight progressed northwest of Kingston. Visual navigation would have

been challenging at night. Any lights on the ground that could have assisted the pilot would have been sparse and, based on forecast and reported weather conditions, may not have been visible. The planned route would take the aircraft over higher terrain. The Kingston airport elevation is 303 ft ASL. The flight would have overflown areas, with maximum elevation figures ranging from 1 700 ft ASL to as high as 2 400 ft ASL. A direct route would have taken the aircraft over spot elevations as high as 1 875 ft ASL in Algonquin Park.

The planned route of flight provided few ground stations from which the pilot could obtain updated weather information or ask for assistance. These ground stations were Kingston, North Bay, Muskoka and Sudbury. Successful radio communications would be subject to the line-of-sight limitations; if the aircraft were to maintain an altitude of 3 000 ft ASL, the theoretical radio range would have precluded communications with both North Bay, located 50 NM northwest of the accident site, and Muskoka, located 65 NM southwest of the accident site.

Analysis

The major part of the occurrence flight was to be conducted at night. While documents indicated the required training to obtain a night rating had been completed, the pilot's license had not yet been endorsed. The pilot had minimal experience flying at night. The pilot had flown this trip before with his instructor, and the aircraft was equipped with a GPS. The pilot likely felt capable of undertaking the flight, notwithstanding the navigational challenges of flying at night over areas that provided few useable visual aids.

Good VFR weather persisted in Kingston for the entire day of October 10, 2009. Before calling the London FIC for a weather briefing prior to departing Kingston, the pilot had already inferred that the forecast conditions for Sudbury were improving.

The pilot's first phone call to the London FIC for a weather briefing occurred 1.5 hr prior to the actual departure from Kingston. The briefer informed the pilot of the forecast weather that could be encountered ahead and behind the cold front. The briefer also indicated that the front was expected in the Sudbury area at about the same time as the aircraft's planned arrival.

The pilot obtained a weather briefing by phone and, in all likelihood, did not have the GFA to refer to, thereby precluding any visualization of the weather. Otherwise, the pilot would have seen that the forecast weather associated with the front would be encountered en route, well before reaching the frontal surface and destination. The pilot likely assumed the weather to be strictly associated with frontal passage, hence the decision to leave as soon as possible to

arrive in Sudbury before the front. Moreover, based on the briefing, the pilot focused almost exclusively on the destination forecast weather, to the exclusion of the weather forecast reported elsewhere along the flight route.

Having created a weather image an hour earlier, the pilot's subsequent conversation with the London FIC suggested more favourable forecast conditions in Sudbury. This may have served to confirm the pilot's initial decision. Here again, the exchanges between the pilot and the briefer focused exclusively on the forecast at the destination and not en route.

The aircraft altitude likely did not exceed 3 000 ft ASL throughout the duration of the flight. Flight at that altitude would have made radio contact with en route ground stations difficult, if not impossible. Even if radio contact was possible, there were few weather reporting stations from which the pilot could have made a reasonable reassessment of the conditions and reviewed the decision to continue toward the destination.

The initial part of the flight was along a direct line from Kingston to Sudbury, indicating the pilot was likely navigating via the onboard GPS. When the aircraft was subsequently picked up by the North Bay radar, it was significantly north of the desired track. The aircraft was also descending with frequent heading changes. This suggests the pilot was navigating around cloud and/or terrain, trying to find a clear route between the clouds and the hills. Although the aircraft was north of the initial Sudbury track, it was on a westerly heading when it struck trees, rather than a northerly heading towards the alternate airport in North Bay. This suggests the pilot was still attempting to proceed to the destination.

Originally shaped as a line from north to south, the weather system was moving from west to east. It covered an area from Southwest Ontario to north of Sudbury. The heaviest concentration of precipitation was at the front, where there were no weather reporting stations. A mixture of rain, snow and strong winds were also present. As it moved east, the front began to change shape and appeared to be more convex. This meant that, at the outer tips, the weather was not as severe and any available weather reports were not indicative of the actual weather likely encountered by the pilot.

The front was changing in appearance while the aircraft was en route and there were no weather updates available to compel a re-evaluation of the pilot's decision. The aircraft was flying from good night VFR weather conditions into deteriorating weather conditions. Visibility would have been reduced as the cloud deck dropped and the precipitation increased. This, combined with the fact that Algonquin Park has very few light sources to provide ground reference, would have made it difficult for the pilot to maintain visual reference with the ground. The pilot was not IFR rated, so climbing into and, perhaps, above the cloud to divert to North Bay was not an option.

The pilot had not obtained altimeter settings for stations along the flight route during the weather briefings. The planned route would take the aircraft over rising terrain and toward an area of lower pressure. The temperatures were also below International Standard Atmosphere (ISA) conditions. Therefore, if left untouched, the altimeter would have read approximately 130 feet higher than the actual altitude of the aircraft.

Findings as to causes and contributing factors

1. The pilot, with minimal night flying experience, took off at night without fully appreciating the marginal weather that was forecast en route.
2. The pilot planned the flight over inhospitable terrain that afforded few visual cues for VFR navigation and continued flying into deteriorating weather conditions.
3. The pilot likely encountered conditions where ground reference was lost and altitude was not maintained, resulting in the aircraft striking trees in an area of rising terrain.

Findings as to risk

1. The altitude at which the aircraft was flown precluded radio communication with ground stations along the flight route. This increases the risk that pilots may be unable to obtain critical flight information on a timely basis.
2. The failure to apply current altimeter settings along the flight route, particularly from an area of high to low pressure, may result in reduced obstacle clearance.

Other finding

1. Although the pilot had the required training for a night rating, there was no documentation found that a night rating had been issued by Transport Canada. Δ

Rotorcraft Technology and Safety

by Stéphane Demers, Civil Aviation Safety Inspector, Rotorcraft Standards, Standards Branch, Civil Aviation, Transport Canada

This past spring, the rotorcraft industry met at their annual tradeshow followed by a safety summit, in Vancouver. The trade show is organized by the Helicopter Association of Canada (HAC) and the safety summit is the brainchild of the hosts, the Canadian Helicopter Corporation (CHC).

After these events, it was clear that the helicopter industry today is focused on two key factors: technology and safety. During the HAC trade show, I saw that modern cockpits, advanced maintenance and operating software, and safety management systems (SMS) were the lead influences for today's operators.

Customer demand and a direct impact on profit margins have been driving the industry to embrace these changes. As SMS settle and mature into our aviation fibre, it is becoming an expected part of the aviation asset the customer demands, in addition to new technology. Not so long ago, you would never have expected to see an older light helicopter with a glass panel, but this is becoming more of a norm as operators keep up with customer expectations. It is becoming difficult to find a new machine with anything other than a glass panel, often with complete night vision goggle (NVG) compatibility, directly from the manufacturer. Similarly, the layers of safety—improved through the implementation of an SMS—are no longer only for offshore operators, as customers also expect this from many aerial work or air taxi operators.


From a regulator's point of view, it gives Transport Canada (TC) new challenges, but these trends clearly point towards increasing the safety of the travelling public, which to TC includes all of the crews flying in and around those helicopters. While there is no denying that recent global financial downturns have affected aviation, the demand for new technology and safer operations remains strong and shows no sign of letting up.

The HAC trade show provided an excellent opportunity to mingle with operators and manufacturers to see the full spectrum of new technologies available. Of course, there are always the new aircraft and engines, but there were also a great deal of software solutions to track aircraft in the field in addition to software used for tracking maintenance and logistics. All of this adds to the effectiveness of any business and provides great tools that dovetail nicely with a company's SMS. There were excellent breakout sessions covering safety, operations and government regulations topics. What was particularly interesting was the requirement for proper regulations governing the use of Night Vision Imaging Systems (NVIS) in Canada. Many operators already use NVG and the demand continues to grow. Demand for the use of Enhanced Vision

Systems (EVS) using infrared imagery is also growing. The emergence of these new optic systems highlighted a void in our regulations that TC is addressing with keen involvement from industry. TC has been working diligently with operators, training providers and the National Research Council (NRC) to develop regulations that will fully embrace the enhanced capabilities of NVG and EVS. Much like global positioning systems (GPS) have become the norm in nearly all cockpits today, it may well be the same for NVG and EVS within the next 5 to 10 years. The acceptance and availability of these imaging solutions may lead to more revenue work being conducted at night, while enhancing the safety of current night operations, particularly in the Arctic. As these imaging systems mature, we could even "see" an end to unaided night flying.

The HAC forums provided an opportunity for members of organizations, such as the Airborne Law Enforcement Association (ALEA), to voice their concerns regarding regulatory changes in the *Canadian Air Regulations* (CARs) Subpart 4, for Private Operator Passenger Transportation. They feel that the recent renewal of the TC oversight of Subpart 4 operators does not entirely address private rotorcraft operations in law enforcement, including some provincial forestry and wildlife departments. TC listened to the ALEA concerns and will continue to work with private rotorcraft operators towards a solution for appropriate regulatory oversight of their niche operations.

At the CHC Safety Summit, it was particularly pleasing to see representation from across a broad spectrum of aviation. The ever-growing attendance of this event clearly supports the idea that safety is not only important, but also leads to better revenues. The CHC hosts did an outstanding job, as this was by far the best-organized event I've attended in my aviation career. Topics covered diverse subjects such as SMS, new technology in the cockpit, accident investigation, fatigue management and human factors. This event is a must for pilots, dispatchers, maintenance and management alike. It was pleasantly surprising to see so many aviation experts in person after having previously seen them so often on television or in training films.

In summary, it is clear that technology drives safety and that safety drives technology. The new gadgets mean better and safer flying at lower operating costs, and safety systems enhance operations providing a safer environment for everyone, including increased productivity, which leads to better profits. You could almost put safety, technology and profit into one of those little diagrams like we use for recycling, as those three are all connected in an infinite loop. 

Wildlife Hazards: Updates and Advice

by Adrienne Labrosse, Wildlife Management Specialist, Aerodromes Standards, Standards, Civil Aviation, Transport Canada

The risk that wildlife activity on and around an airport poses to flight safety has commonly been understood and respected by the aviation community. However, the general public has remained mostly unaware of the potential hazard that increases in problem species populations, such as Canada geese, create. That is, until January 15, 2009, when the event commonly referred to as the "Miracle on the Hudson" occurred. The ingestion of Canada geese into the engines of US Airways Flight 1549 shortly after taking off from LaGuardia Airport in New York City caused the pilots to ditch the Airbus 320 in the Hudson River. Miraculously, everyone was safely evacuated and media coverage of the event was extremely high, educating those who were previously unaware of the risk wildlife posed to aviation safety.

In Canada, there have also been critical, though less public, bird strikes over the last year. In September of 2010 at the airport in Montmagny, Que., a Beech King Air struck fifteen gulls during climb and lost power in both engines. The aircraft was ditched 1 000 ft off the end of the runway, where everyone on board was evacuated safely and without injury.

In October of 2010, at Edmonton International Airport, an ERJ 190 experienced a multiple Canada goose strike while climbing through 2 000 ft AGL and was forced to declare an emergency and make a return landing. The aircraft sustained significant damage to the engines, cowlings, fan blades and wings.

Birds are not the only threat to aviation safety, especially at smaller airports that have no form of fencing. In Steinbach, Man. in October, a Cessna 152 struck a deer during landing. There were no reported injuries; however, the aircraft sustained substantial damage to its propeller and engine mount.

Effectively managing wildlife at an airport is an important part of reducing the risk of wildlife strikes and is a regulatory requirement at certain airports. However, there are also important actions that pilots can take to further reduce the risks or to successfully deal with a strike should one occur.

Nearly 75 percent of all bird strikes occur within 500 ft of the ground, which also happens to be when aircraft are in the most critical phases of flight and are most vulnerable to loss of control. The probability of bird strikes decreases dramatically after 3 000 ft AGL. Pilots should therefore aim to achieve cruise altitude as soon as possible at the best rate of climb. Flights over areas such as land fills, shorelines



Birds should not be your only concern around some airports, as shown here.

or wildlife sanctuaries that are known to attract birds should be avoided. It is important to remember that birds are more active at dawn or dusk and during spring and fall migrations. If a flock of birds is encountered during flight, and it is safe to take evasive action, pilots should consider climbing above them since anecdotal evidence suggests birds will bank downward or laterally.

If a bird strike does occur, aircraft control needs to be maintained. Pilots should refer to checklists and carry out prescribed procedures. An assessment of the damage and its effects on landing performance is required. A controllability check prior to attempting to land should be considered. If the windshield is penetrated, the aircraft needs to be slowed to reduce windblast. Pilots should use sunglasses or goggles for protection against debris or precipitation and if drag becomes an issue, a rear or side window should be opened. Before returning to the air, the aircraft needs to be inspected by a certified maintenance engineer. The strike is to be reported using the Transport Canada (TC) bird strike reporting system at wwwapps.tc.gc.ca/Saf-Sec-Sur/2/basis/s_r.aspx?lang=eng. The data collected through the submission of strike reports is used to create trend analyses, which reveal problem areas, species, and times of year and day.

TC, in cooperation with the Federal Aviation Administration, has created a DVD and an interactive CD-ROM entitled *Collision Course*, which provides detailed information about wildlife hazards for pilots in commercial, general and rotary wing aviation as well as for instructors at flight training schools. These instructional tools can be obtained by contacting the Wildlife Management Specialist at TC at WildlifeControl-Controledeafaune@tc.gc.ca or 613-990-4869. ▲

Restrictions Affecting Seaplanes

by Mark Laurence, Civil Aviation Safety Inspector, Standards Branch, Civil Aviation, Transport Canada

If you are one of the lucky few that have the opportunity to fly a seaplane, you may have asked yourself at one point, "is it okay if I land here?" This article contains several references that you can use to help answer this question.

When the location is listed in the *Canada Flight Supplement* (CFS) or *Water Aerodrome Supplement* (WAS), it is pretty straight forward, almost pilot proof, I would say. Restrictions are listed whether prior permission is required or not, and a contact name and telephone number are provided.

For locations not contained in the CFS or WAS, but with more obvious "ownership", such as ports (harbours), seaways, or National Parks, you should contact the appropriate authority and ask. The *Canada Marine Act* and its associated regulations may restrict (approval required) or prohibit seaplane operations in ports and seaways. Contact the applicable Port Authority.

The *Canada National Parks Act*, through its regulations, imposes restrictions on the operations of aircraft within national parks. Before you decide to fly into a place such as Lake Louise, check with the authorities at Banff National Park and find out if they would mind. I assume that the authorities would mind, and by "mind" I mean probably seize your seaplane and/or fine you. Contact the appropriate Parks Canada office.

What about lakes? How would you know if a lake was used as a drinking water source for a city or town

resulting in all vessels being prohibited? Some lakes have prohibitions on powered vessels, horsepower restrictions, or speed limits. How do you find out? The Schedules to the *Vessel Operation Restriction Regulations* list, by province, the different types of restrictions (vessel prohibitions, horsepower restrictions, speed limits, etc.) and the bodies of water affected. These can be found at: laws-lois.justice.gc.ca/eng/regulations/SOR-2008-120/?showtoc=&instrumentnumber=SOR-2008-120.

As a seaplane is considered a vessel while operating on the surface of a body of water, the *Vessel Operation Restriction Regulations* apply. The Regulations are published under the *Canada Shipping Act, 2001*.

Have you ever heard of any of these canals: Rideau, Tay, Trent-Severn, Murray, Sault Ste. Marie, Saint-Ours, Chambly, Sainte-Anne-de-Bellevue, Carillon, Lachine, or St. Peters? If you wish to operate a seaplane on any of them, you should take a look at the *Historic Canal Regulations*. There may be restrictions on these canals that you should be aware of before doing so.

Recently, a new section—Restrictions Affecting Seaplanes—was added to both the CFS and the WAS. This section is intended to raise awareness among seaplane pilots that restrictions exist on some bodies of water.

My recommendation is simple: check before you go. △

BLACKFLY AIR





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Do the Right Thing

by Robert I. Baron. This article was originally published in the February 2011 issue of AeroSafety World magazine and is reprinted with the permission of the Flight Safety Foundation.

Professionalism and integrity are the last barriers against unapproved or unwise short cuts.

An experienced and qualified aircraft maintenance technician (AMT) with a tight deadline discovered that he needed a special jig to drill a new door torque tube on a Boeing 747. The jig was not available, so he decided to drill the holes by hand with a pillar drill—a fixed workshop drill and an unapproved procedure.

Subsequently, the door came open in flight and the flight crew had to make an emergency landing. The AMT, being a “company man” and trying to get the aircraft out on time, committed what is known as a situational violation. A situational violation occurs when an AMT, typically with good intentions, deviates from a procedure to get the job done.

The reason for a procedural deviation may stem from time pressure, working conditions or a lack of resources. This example is not only a classic maintenance human factors error, but also speaks to the issue of professionalism and integrity conflicting with efficiency.



A door came open in flight as a result of a desire to get the aircraft out on time.

The European Aviation Safety Agency (EASA), in its suggested syllabus for human factors training for maintenance, specifically mentions professionalism and integrity as a training topic. But what are “professionalism and integrity,” and can they even be taught? The Merriam-Webster dictionary defines professionalism as “the conduct, aims or qualities that characterize or mark a

profession or a professional person” and defines integrity as “a firm adherence to a code of moral values.” The topic can be nebulous and difficult to develop into a training module, yet is unquestionably a critical part of a healthy safety culture.

Regulations offer some aviation-specific guidance on teaching professionalism and integrity. For instance, the U.K. Civil Aviation Authority has a small section in Civil Aviation Publication (CAP) 716, *Aviation Maintenance Human Factors* (EASA Part 145) about the subject. Two key points discussed are, first, that employees basically know how to behave in a professional manner but may be limited in doing so due to organizational issues such as pressure, lack of resources, poor training, etc.; and that, in a human factors training course, it is up to the trainer to determine whether problems with professionalism are on an individual or organizational level and tailor the training accordingly.

CAP 716 does not elaborate on the topic of integrity as it does with professionalism, perhaps because it is assumed that they overlap. That is partly true, but integrity still warrants a bit more elucidation.

Based on the definition of integrity as “a firm adherence to a code of moral values,” this is where things can get interesting. How can an employee adhere firmly to a code of moral values that is largely unwritten and not available to look up in the employee handbook? A code of values is something that is learned through upbringing and life experiences. By the time a person becomes gainfully employed, he or she should have a good idea of what is morally or ethically right. Yet corporate greed and power can cause otherwise good people to cross the line, sometimes hazy, between right and wrong.

While financial scandals on a corporate level are rare in aviation, significant events have occasionally led to deviations from integrity, typically in the normal pursuit of cost savings and efficiency. For instance, the crash of American Airlines Flight 191, a McDonnell Douglas DC-10-10, at Chicago O'Hare International Airport on May 25, 1979, was precipitated by procedures that were put in place by the company's maintenance management.

Management accepted the use of a forklift to change engines on the aircraft. The U.S. National Transportation Safety Board (NTSB) found serious omissions, however, in its final report on the accident:

"Carriers are permitted to develop their own step-by-step maintenance procedures for a specific task without obtaining the approval of either the manufacturer of the aircraft or the FAA [U.S. Federal Aviation Administration]. It is not unusual for a carrier to develop procedures which deviate from those specified by the manufacturer if its engineering and maintenance personnel believe that the task can be accomplished more efficiently by using an alternate method.

"Thus, in what they perceived to be in the interest of efficiency, safety and economy, three major carriers developed procedures to comply with the changes required in [service bulletins] by removing the engine and pylon assembly as a single unit. ... Both American Airlines and Continental Airlines employed a procedure which damaged a critical structural member of the aircraft. ...

"The evidence indicated that American Airlines' engineering and maintenance personnel implemented the procedure without a thorough evaluation to insure that it could be conducted without difficulty and without the risk of damaging the pylon structure. The [NTSB] believes that a close examination of the procedure might have disclosed difficulties that would have concerned the engineering staff. In order to remove the load from the forward and aft bulkhead's spherical joints simultaneously, the lifting forks had to be placed precisely to insure that the load distribution on each fork was such that the resultant forklift load was exactly beneath the center of gravity of the engine and pylon assembly. To accomplish this, the forklift operator had to control the horizontal, vertical and tilt movements with extreme precision. The failure ... to emphasize the precision this operation required indicates that engineering personnel did not consider either the degree of difficulty involved or the consequences of placing the lift improperly. Forklift operators apparently did not receive instruction on the necessity for precision, and the maintenance and engineering staff apparently did not conduct an adequate evaluation of the forklift to ascertain that it was capable of providing the required precision."

Maintenance management failed to discover that using the forklift was creating an unseen crack in the accident aircraft's engine pylon. This crack continued to propagate and eventually caused the left engine to depart from the aircraft on its take-off rotation and the aircraft to crash shortly after becoming airborne. Two hundred and fifty-

eight people (including 13 crew members) aboard the aircraft and two people on the ground were killed.

The crash of American Flight 191 can be interpreted as an example of the integrity line being crossed in one respect. The forklift procedure was designed so that the aircraft would spend less time in maintenance and more time generating income. When management changed a procedure without adequate safety analysis, however, lower level employees were "along for the ride."

Integrity also encompasses adequate company and regulatory oversight of a maintenance procedure. This issue was involved in the crash of Continental Express Flight 2574 in 1991, in which 47 screws were not re-installed on the horizontal stabilizer during a shift turnover. The NTSB said, "The probable cause of this accident was the failure of Continental Express maintenance and inspection personnel to adhere to proper maintenance and quality assurance procedures for the airplane's horizontal stabilizer deice boots that led to the sudden in-flight loss of the partially secured left horizontal stabilizer leading edge and the immediate severe nose-down pitchover and breakup of the airplane. Contributing to the cause of the accident was the failure of the Continental Express management to ensure compliance with the approved maintenance procedures, and the failure of FAA surveillance to detect and verify compliance with approved procedures."

Such failures can be extrapolated to a fundamental question about personal integrity. Why would employees, as individual professionals, go "along for the ride" with these types of breaches in integrity if they know they are working contrary to approved procedures? Sometimes this is a matter of *norms* of the safety culture, or the "normal" way work is being conducted, whether right or wrong.

Social psychological phenomena such as cognitive dissonance and conformity also may be involved. Cognitive dissonance occurs when reasoning is consonant (in agreement) and dissonant (incongruous) at the same time. This might happen when an employee knows that an incorrect procedure is being used universally but, at the same time, does not want to speak up for fear of castigation.

Similarly, conformity is a strong social psychological phenomenon that occurs when an employee chooses to "go with the crowd" rather than stand out as a complainer, loner, non-team player, etc. Conformity can be further exacerbated by the tremendous peer pressure that often develops in groups. Individual employees need to realize that, although these pressures are commonplace and perhaps inevitable, they do not relieve the employee

from the responsibility to speak up and challenge unsafe instructions. Otherwise, on a personal level, they are overstepping the bounds of integrity and their actions may become a contributing factor in an aircraft accident or incident.

The topic of professionalism and integrity is clearly not popular in the field of aviation human factors. It is reasonable to assume that this is due to the topic's socially awkward nature and the diversity of opinion and work experiences. Trying to "teach" the topic also can be confounding because many instructors have a hard time compiling relevant information. Overall, there is not much guidance compared with that available for other human factors topics.

So, again, can professionalism and integrity be taught? Perhaps in principle, but applying them in the workplace is largely the responsibility of the individual, since they are based on values, not a technical process that can be measured and supervised.

What should be the baseline expectation for professionalism and integrity among AMTs? From my

own search for common principles, I propose these as starting points:

- Arrive at work on time and be prepared to work.
- Stay current on procedures, and strive to increase your knowledge.
- Respect your peers—even if you don't particularly care for them.
- Be part of the team effort to make safety the no. 1 priority.
- Be assertive with management whenever necessary for safety.
- Watch for opportunities to draw the line between right and wrong.
- Be alert for business expediency that drives unsafe deviations from approved procedures.
- Do not "go with the flow" when the flow is going the wrong way.
- Ask yourself if actions deemed legally or technically acceptable could be morally wrong.

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Issuance of Maintenance Authorizations

by Joel Virtanen, Civil Aviation Safety Inspector, Operational Airworthiness, Standards Branch, Civil Aviation, Transport Canada

Section 571.05 of the *Canadian Aviation Regulations* (CARs) requires that all commercially operated aircraft have maintenance performed and certified by an approved maintenance organization (AMO) or a foreign equivalent that is appropriately rated for the scope of work to be undertaken. In addition, all specialized work, regardless of whether it involves commercial or private aircraft, must also be performed by an AMO that is rated for that particular specialty.

CAR Std. 573.05(1) states that, "an AMO shall issue an authorization to those individuals who will sign a maintenance release in respect of work performed on an aircraft." This authorization is called aircraft certification authority (ACA) and can be issued to an aircraft maintenance engineer (AME). As referenced in CAR 571.11, the work on an aircraft must be released for return to service by an AME who holds ACA.

It is the AMO's responsibility to ensure that the person being nominated for ACA is a holder of a valid AME licence rated for the aircraft type (CAR 571.11), and has satisfied all of the training requirements related to the aircraft type(s) for both initial and update training.

Please refer to CAR Std. 573.06 for more details on ACA training requirements.

Once the AMO is satisfied that the candidate ACA meets all the requirements, the organization is in a position to issue ACA to the AME. However, it should be noted that not all qualified AMEs necessarily receive ACA from the AMO and under CAR 573.07(1)(a), the AMO must identify which of the qualified AMEs have been granted that authority and document it.

Another characteristic of the ACA system is that an organization may choose to further limit individual maintenance release privileges or the work scope to an aircraft system, subsystem or process. This is very often the case in large organizations where maintenance release control is supported by a highly specialized work force. Notwithstanding the basic privileges of the licence, in a commercial environment, the AMO determines who and to what degree a qualified ACA can issue a maintenance release.

Some Canadian operators conduct business in countries that do not have aviation safety agreements with Canada. In these instances the AMO can extend its own quality assurance system to that location and issue an ACA

based on the foreign licence with privileges limited to line maintenance, as defined in Std. 573.02. Advisory Circular (AC) No. 573-002 provides guidance to an AMO to issue an ACA based on a foreign licence. This is to enable the issuance of ACA, outside of Canada, based on foreign qualifications equivalent to a Canadian AME licence, pursuant to subparagraph 571.11(2)(a)(ii) of the CARs.

Foreign ACAs may only be granted to persons working under the direct control of the granting organization and it is not acceptable for an AMO to issue ACA to an employee of a contracting organization that is performing the work under its own domestic approval. However, ACA may be made conditional upon the holder working within the framework of a contracting organization. In these cases (where the ACA relies in part on the oversight or support services of a foreign organization), the Canadian AMO may ensure the necessary direct control by adopting (and obtaining TC approval for) the applicable sections of the foreign organization's procedures as its own, with regard to maintenance performed at the foreign base. Under these circumstances, ACA will only be valid while the foreign ACA holder has ACA privileges issued by the contracting organization. The scope of privileges of foreign licences may vary widely. Some, like the Canadian AME licence, may have very broad privileges. Others may be limited to particular aircraft systems or components.

Now, let's look at shop certification authority (SCA) to better understand what it is and how it differs from ACA. To begin with, just as in the case of ACA, SCA is

a controlling instrument that is used within the AMO process. However, a significant difference between the two privileges is that while ACA is associated with "on-aircraft" maintenance release, SCA is limited to off-aircraft certification. In other words, a qualified individual may certify an aeronautical product(s) for which SCA has been issued, but the privilege will be limited to off-aircraft work. This is the highly specialized individual who certifies after repair, modification or overhaul, at the rotatable, appliance, or component level within a shop environment.

It is important to remember that in all instances following SCA certification, once the item is pulled from stores or the shop and installed on the aircraft, a maintenance release must be signed by the holder of an ACA within that organization. If the item is sent out for outside use, maintenance release becomes a third party responsibility following installation. In this manner, system integrity is assured and confirmed by the holder of the broader based on-aircraft licence.

Prior to the issuance of SCA, the AMO shall ensure that the person holding the qualification understands his/her responsibilities in accordance with the applicable regulations, and has demonstrated levels of knowledge and experience that meet the applicable requirements in Std. 573.05(2).

Both ACA and SCA serve distinctive yet complementary roles in a commercial environment where work performance and maintenance release contribute equally to a safety-oriented aviation maintenance industry. Δ

Fatigue Risk Management System for the Canadian Aviation Industry: Trainer's Handbook (TP 14578E)

This is the seventh and last of a seven-part series highlighting the Fatigue Risk Management System (FRMS) Toolbox for Canadian Aviation, developed by Transport Canada and fatigue consultants Edu.au of Adelaide, Australia. This article briefly introduces TP 14578E—Trainer's Handbook. In addition to a training presentation on fatigue, fatigue management systems, and individual fatigue management strategies, the package includes background information for delivery of the workshop, learning outcomes, and questions frequently asked by participants. The complete FRMS toolbox can be found at www.tc.gc.ca/eng/civilaviation/standards/sms-frms-menu-634.htm. —Ed.

Purpose of the Trainer's Handbook

An important part of a fatigue risk management system (FRMS) consists of training all employees in the management of fatigue as a safety hazard. Training materials have been designed to meet the business needs of participating organizations and the skills development needs of their employees in relation to fatigue risk management.

This handbook is intended to provide you, as a trainer, with the tools and strategies to prepare and deliver

the face-to-face component of the employee training, *Fatigue Management Strategies for Employees*.

- slideshow presentation;
- speaking notes;
- information on how to prepare the workshop;
- frequently asked questions; and
- bibliography of reference material.

Training format

The slideshow presentation (available for download on the FRMS Web site) is structured so that it can be tailored to different employee groups (e.g., maintenance employees, flight crew, cabin crew). The presentation provides a good

overview of fatigue risk management and is intended to be used in conjunction with the paper or web-based employee training tools and assessment to ensure that participants have understood and can apply the knowledge presented in the workshop.

The presentation is most effective for groups of 10 to 20 people to allow for participant interaction. Participants in groups this size tend to retain more knowledge and get greater benefit from the face-to-face training sessions.

Slideshow presentation

The most important component of this handbook is the slideshow presentation. The presentation is approximately 180 minutes long, and has been divided into three modules:

1. Causes and Consequences of Fatigue
2. Fatigue Risk Management
3. Personal Fatigue Countermeasures

The presentation should be casual, and participants encouraged to ask questions and/or share personal anecdotes. Group activities are provided throughout to encourage interaction. You should use a whiteboard or flipchart to document participant responses to the group activities.

Speaking notes

The notes section of the presentation contains a comprehensive set of speaking notes for each slide. You should use the text as a guide, and adjust the words, phrasing, and examples to your own presentation style and experience.

Prepare for the workshop

You should be familiar with the organization's FRMS. Review the training material and make changes as required to ensure the slides are consistent with company policy. Pay particular attention to slides 19 and 20, which are intended to outline the specific responsibilities of employees and management under the organization's FRMS.

Make yourself familiar with the training material—in particular, the frequently asked questions section of this handbook. It's a good idea to become familiar with the other manuals, guides, and workbooks in this series. Consult the list of reference material if you would like to know more about certain topics.

We conclude this overview of TP 14578E by encouraging our readers to view the entire document at www.tc.gc.ca/Publications/en/TP14576/PDF/HR/TP14576E.pdf. ▴

Answers to the 2011 Self-Paced Study Program

1. It is a means for individuals to report incidents and potentially unsafe acts or conditions relating to the Canadian transportation system to the TSB.
2. 50
3. altitude encoding transponder
4. in use at the time
5. 24; 1-866-WXBRIFEF
6. hatched areas enclosed by a dashed green line
7. 6; dashed orange line
8. 200 ft overcast
9. After 1300Z
10. one hour, one hour, FM, BECMG
11. Degrees true
12. A "SPEC" report is issued to report significant changes in weather conditions which occur off the hour.
13. SIGMET
14. four; too rapidly or too slowly
15. On navigation charts, in the CFS, and in NOTAMS.
16. Gliders and balloons, 10 000, 12 500
17. landing or about to land
18. 2 000 ft AGL
19. 2 000 ft horizontally and 500 ft vertically
20. receiving acknowledgement that it has been received
21. see CFS
22. 5; 6; 2; 5
23. March 21, 2011 at 2359 UTC
24. NAV CANADA
25. 2 to 4 inclusive
26. high
27. contrast
28. 48 hrs
29. Mirror, fire, smoke, pyrotechnics, etc. as per annex 1.0
30. higher; lower
31. lowest
32. 123.4
33. 80/200
34. tendency to further decrease airspeed, leading to a loss of translational lift
35. rate of descent
36. Main rotor vortex interference
37. A decreased rate of climb unless more heat is added
38. turn off the valve that controls the leaking or burning fuel



RECENTLY RELEASED TSB REPORTS

The following summaries are extracted from Final Reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some extracts from the analysis section may be included, where needed, to better understand the findings. For more information, contact the TSB or visit their Web site at www.tsb.gc.ca. —Ed.

TSB Final Report A07P0209—Tail Rotor Driveshaft Fracture

On July 2, 2007, a Bell 214B1 helicopter was carrying out heli-logging operations in Ramsay Arm, B.C. At about 08:00 PDT, the helicopter was in a 200-foot hover and starting to pick up the 11th load when the two pilots noted a loud growling sound from within the helicopter. Immediately, the flying pilot discontinued the lift and released the load from the longline hook. He then flew the helicopter back towards the nearby service area to have the noise investigated. About 20 sec later, just as the helicopter entered a high hover above the service landing site, the growling noise stopped, the low oil pressure warning lights for the two tail rotor gearboxes illuminated, and the helicopter rotated quickly to the right. The pilot was unable to stop the rotation using the tail rotor control pedals and the helicopter made two or three 360° turns to the right. The pilot rolled off the throttle on the collective stick and attempted to land in trees adjacent to the service area. The helicopter descended upright and struck several trees before landing hard on the uneven terrain. The flying pilot, seated in the left hand seat, was seriously injured and the co-pilot received minor injuries. The helicopter was substantially damaged during the landing and there was no fire. The emergency locator transmitter activated at impact and survived the crash.



Bell 214B1 wreckage

Findings as to causes and contributing factors

1. The tail boom had been subjected to extreme heat from the engine exhaust during its service life and, over time, certain tail boom skin panels developed structural weaknesses.
2. The reduction in the strength and stiffness of the tail boom skin in the area damaged by exhaust gas heating likely allowed the tail boom to distort excessively under high-power settings.
3. The No. 3 tail rotor driveshaft segment broke as a result of severe scoring caused by heavy contact with the tail boom, which was precipitated by tail boom distortion.
4. The No. 3 tail rotor driveshaft was also subject to in-flight bending that likely exacerbated the heavy contact with the distorted tail boom.
5. Had the pilot-in-command been wearing the available upper body restraint (shoulder harness), his injuries would have been lessened.

Findings as to risk

1. The lack of documented service history for the tail rotor driveshaft prevented effective traceability of a condition-monitored component that was essential to the continued operation of the helicopter.
2. Vertical reference flying necessitates upper body freedom of movement, typically resulting in the non-use of the shoulder harness. This exposes pilots to greater injury in the event of a collision with the terrain.
3. Most helicopters are not designed to accommodate vertical reference flying techniques, and certification for external load operations does not take them into account, thus increasing the risk of injury in a collision.
4. The withholding of engineering information and tests by manufacturers impairs the timely discovery of accident causes, denying operators vital information and the opportunity to avoid their re-occurrence.

Other finding

1. The pilot's flight helmet prevented life-threatening head injuries during the collision with terrain; many Canadian helicopter operators encourage their pilots to wear helmets in most operational environments.

Safety action taken

As a result of the investigation into this Bell 214B1 accident, the operator has voluntarily chosen to replace its Bell 214B1 tail boom skins every 5 000 flight hr. Another operator, which is also a maintenance, repair and overhaul facility for this model, said it will replace its tail boom skins every 3 000 hr.

TSB Final Report A07W0128—Collision at Takeoff

On July 8, 2007, at approximately 12:35 PDT, a de Havilland DHC-6-100 Twin Otter was taking off from a gravel airstrip near the Northern Rockies Lodge at Muncho Lake on a visual flight rules flight to Prince George, B.C. After becoming airborne, the aircraft entered a right turn and the right outboard flap hanger contacted the Alaska Highway. The aircraft subsequently struck a telephone pole and a telephone cable, impacted the edge of the highway a second time, and crashed onto a rocky embankment adjacent to a dry creek channel. The aircraft came to rest upright approximately 600 ft from the departure end of the airstrip. An intense post-impact fire ensued and the aircraft was destroyed. One passenger suffered fatal burn injuries, one pilot was seriously burned, the other pilot sustained serious impact injuries, and the other two passengers received minor injuries.



Analysis

The weather conditions were suitable for visual flight and field examination of the wreckage gave no indication that a pre-occurrence mechanical problem had contributed to the accident. Although the performance of the left engine was slightly less than that of the right engine during the take-off roll, the torque pressure on both engines exceeded the expected take-off power setting of 39.5 psi torque pressure for the existing temperature and pressure altitude, and the propeller rpms compared favourably with normal take-off values. The analysis will therefore discuss the organizational and management factors that contributed to the aircraft

being operated outside of its performance capabilities on the accident takeoff.

Organizational and management factors

The operational control and the risk management practices that existed within the operator did not recognize and reduce or eliminate the risks associated with takeoffs from the lodge airstrip. The operator was in a state of administrative transition at the time of the accident due to several recent changes in key personnel; the Twin Otter operation was most affected by this transition.

A number of organizational policies and procedures that may have prevented the accident were either violated, not used, or missing. The operator's operations manual was written to ensure safe flight operations and to eliminate potential errors in flight crew judgement. Although a weight and balance calculation had been accomplished prior to the accident flight, the aircraft weight was not used to calculate take-off performance, as required by the operations manual. Takeoffs from the lodge airstrip had come to be regarded as routine, without a need to calculate take-off performance prior to each departure, and aircraft loading was based mostly on the intuition and judgement of the owner and/or flight crews.

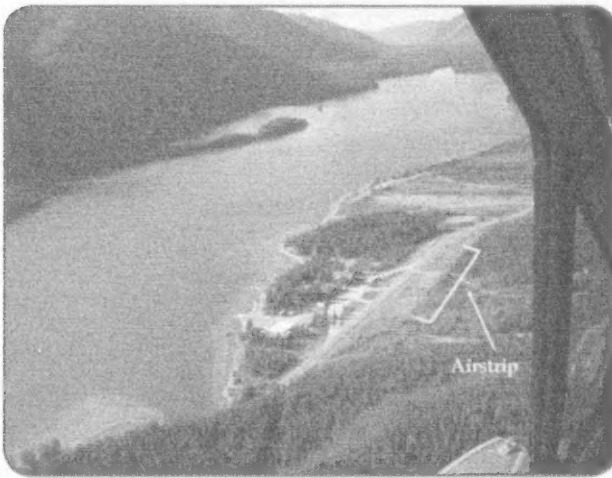
The operator had an unwritten company policy that the lodge airstrip would be used primarily to store the Twin Otter and that Twin Otter departures from the airstrip would be carried out with crew only and minimum fuel on board. Records of previous takeoffs from the airstrip indicated that the policy of not carrying passengers out of the lodge airstrip was rarely violated, although takeoffs were occasionally accomplished with heavy fuel loads. On the day of the accident, this policy was violated in two ways: the takeoff was attempted with three passengers and the aircraft had a full load of fuel.

Training provided by the owner to the captain emphasized the use of 30° of flap for short-field takeoffs when 10° of flap would have resulted in lesser distance to climb to 50 ft. Considering the elevation, length, slope, and gravel surface at the lodge airstrip, maximum performance short takeoff and landing (MPS) procedures may have been required at times for higher weight takeoffs; however, neither the company nor the aircraft were approved for MPS operations and neither flight crew member had received appropriate MPS training.

The operator's owner was the main decision-maker within the company. He was entirely familiar with the company's daily operations, he was highly influential with respect to how flights were to be carried out, and he had significant experience with Twin Otter operations on the lodge airstrip. These elements, combined with his direct

input at the pre-flight planning phase of the accident flight, contributed to the flight crew expectation that the takeoff could be accomplished successfully. As well, the regular direct oversight that he provided in the Twin Otter operation may have resulted in ambiguity with regard to the duties and responsibilities of those involved with the Twin Otter operation.

Despite regular use of the lodge airstrip and recognition by the owner that take-off weights were a critical consideration in these operations, there was no standard operating procedure (SOP) for Twin Otter short-field operations. An applicable SOP would have formalized and set the non-MPS limits for short field operations, thereby reducing the risk associated with lodge airstrip operations.



Lodge airstrip in direction of takeoff

Work setting

The work setting and work expectations at the operator were unlike those found in the corporate or airline environments that were most recently familiar to the captain and the first officer. The operational support provided in corporate and airline operations, in the form of dispatchers, ground crews, locally available maintenance personnel, and highly-formalized operational procedures rarely exist in similar small, seasonal bush-flying operations. As a result, flight crews working for seasonal bush-flying operators often rely heavily on local knowledge gained through experience with a particular operator and are typically more self-reliant when it comes to making day-to-day operational decisions. As well, the operational challenges encountered in confined, short-airstrip environments can be significantly different from those encountered in corporate and airline operations, where longer runways and obstacle-free climb-out corridors are the norm.

Flight crew

The captain and the first officer were themselves the final line of defence in the system. Both were relatively new to the operator's working environment and to lodge airstrip operations. The captain had been hired and appointed chief pilot about five weeks prior to the accident. His initial administrative workload as chief pilot and his flight duty obligations were significant, which may have reduced the time available to experience, recognize, and evaluate the risks associated with the operator's flight operations from the lodge airstrip. Critical information regarding the accident flight was provided to the captain in a somewhat piecemeal fashion between the time of the original early morning discussion and the departure; however, the captain expected the takeoff would be successful, based on his belief that both the owner and the first officer had discussed and considered the take-off weight.

The first officer was more familiar than the captain with the circumstances leading up to the flight, having taken most of the morning to prepare the aircraft. His expectation of a successful takeoff was likely based on his conversations with the owner and the captain. He verbally provided the captain with weight and balance information; aside from that, he appears to have placed full responsibility for the decision to attempt the takeoff on the captain, who was only peripherally involved with the flight planning.

The captain had recently been flying DHC-6-300 series aircraft in the Maldives. Although that experience involved only float-equipped Twin Otters, his recent familiarity with the higher performance capabilities of the DHC-6-300 series aircraft may have conditioned him to anticipate a higher level of aircraft performance in the operator's DHC-6-100 series operations. As well, both pilots were aware that the aircraft had been operating out of the lodge airstrip for several years, which reinforced their expectation that the takeoff should be successful.

Pre-flight planning

Pre-flight planning is an essential component of any flight and flight crews are required by regulation to avail themselves of all obtainable information pertinent to a flight prior to departure. Because the DHC-6 Twin Otter is a very capable short-field aircraft, it is commonly used on short, unprepared airstrips where there is little margin for error in flight crew judgement or performance. In all cases when operating in short-field environments, it is imperative that flight crews recognize and operate within the take-off performance limitations of the aircraft.

Pre-flight load planning for the accident flight primarily involved the owner and the first officer. The captain agreed to take off from the lodge airstrip with one passenger. He went flying soon after and had no direct input into the

later decisions to add full fuel and two extra passengers to the flight. The owner also went flying and was therefore no longer in a position to closely monitor the progress of the pre-flight preparations or consider the addition of a third passenger on the aircraft. Although the first officer spent most of the morning preparing the aircraft, he prepared only a weight and balance report and did not complete a take-off performance calculation.

Critical information regarding the significance of surface wind, temperature, and aircraft weight on operations specific to the lodge airstrip may not have been communicated to the flight crew during training. Despite changes in wind and temperature conditions and the much higher than normal take-off weight for lodge airstrip departures, neither pilot recognized the need to reconsider the take-off weight. The final decision to attempt the take-off represented a collective failure on the part of the owner, the captain, and the first officer to recognize and manage the risks associated with lodge airstrip operations.

Takeoff

The aircraft was not positioned so as to use the entire airstrip before commencing the takeoff and the brakes were released prior to the engines achieving take-off power. Both of these elements made it less likely that the aircraft would achieve the necessary obstacle clearance altitude. The use of the lodge airstrip left no margin for error and once the take-off roll began, there was little time to evaluate the aircraft's performance and if necessary reject the takeoff. Had the flight crew identified a suitable reject point for the takeoff and had the takeoff been rejected due to the aircraft not being airborne at that point, the accident risk would have been reduced.

The aircraft used most of the available airstrip during the takeoff and drifted approximately 20° to the left during the latter part of the takeoff for unknown reasons. This required the initiation of a steep bank to remain over the highway corridor on climb-out that reduced the climb performance of the aircraft and increased the likelihood of the aircraft contacting the telephone cable.

Considering the airstrip length and slope, the wind and the temperature conditions, the location of the telephone cable, and the take-off procedures that were used, the takeoff was attempted at a weight that exceeded the obstacle clearance performance capabilities of the aircraft. Had a take-off performance calculation been accomplished prior to take off, it would have identified that the distance available was inadequate for takeoff under these conditions.

Findings as to causes and contributing factors

1. The takeoff was attempted at an aircraft weight that did not meet the performance capabilities of the

aircraft to clear an obstacle and, as a result, the aircraft struck a telephone pole and a telephone cable during the initial climb.

2. A takeoff and climb to 50 ft performance calculation was not completed prior to take off; therefore, the flight crew was unaware of the distance required to clear the telephone cable.
3. The southeast end of the airstrip was not clearly marked; as a result, the takeoff was initiated with approximately 86 ft of usable airstrip behind the aircraft.
4. The takeoff was attempted in an upslope direction and in light tailwind, both of which increased the distance necessary to clear the existing obstacles.

Safety action taken

Following the accident, Transport Canada conducted a regulatory audit on the company. The Twin Otter was not replaced and the operator voluntarily gave up the *Canadian Aviation Regulation* section 704 privileges on the company's air operator certificate.

Following this accident, the owner initiated the following corrective action within the operation:

1. Every pilot employed by the operator will receive and be required to read and sign a letter that summarizes the pilot's responsibilities in the operation of the operator's aeroplanes.
2. The operator purchased and installed satellite telephones in each floatplane to improve direct communication between pilots.
3. The operator's Maintenance Control Manual has been amended to require any seatbelt in any company aircraft to be replaced after 10 years, even if the manufacturer has not put a life on the seatbelt.
4. Weight and balance samples for various loading configurations in company aircraft have been calculated and a computer program is now in use for weight and balance calculations at the home base. The weight and balance calculations and the formulas used will only be the ones issued by the aeroplane manufacturer.

TSB Final Report A07O0314—In-flight Engine Failure

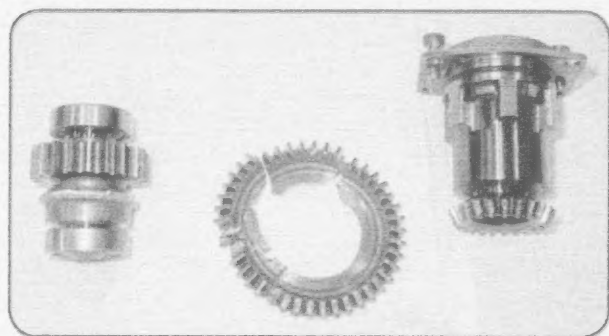
On November 23, 2007, an Aerospatiale AS 350 B3 helicopter was en route from London, Ont. to Windsor, Ont. at 2 000 ft ASL. At approximately 07:55 EST, the helicopter yawed sharply to the right, the rotor rpm dropped, the engine chip and governor light illuminated, and the warning horn sounded. The engine (a

Turbomeca Arriel 2B) had failed and the pilot commenced an autorotation landing into a farm field. During the descent, the pilot transmitted a mayday call and activated the emergency locator transmitter. The helicopter landed without further incident. There were no injuries and the helicopter was not damaged. The pilot completed the shutdown checklist and switched off the battery.



AS 350 sitting in the field after the successful autorotation with no damage at all. Great job by the pilot!

An examination of the engine determined that the 41-tooth bevel gear (part number 0292127330) had fractured due to high-cycle fatigue cracking. The gear was installed during engine manufacture and had accumulated a total of 1 644 hr since new. Metallurgical examination (TSB Laboratory report LP 005/2008) of the bevel gear revealed numerous fatigue cracks radiating from the roots of many of the gear teeth. Circumferential fatigue cracks were also observed in the rim of the gear. There were no relevant manufacturing flaws found in the gear that could contribute to the failure.



Fractured 41-tooth bevel gear shown with other parts from the accessory gearbox

Findings as to causes and contributing factors

1. The 41-tooth bevel gear of the accessory gearbox module 1 (MO1) accessory gear box failed due to high-cycle fatigue causing an uncommanded in-flight engine shutdown.
2. The dampening system of the starter-generator was found to be over-tightened which caused torsional

oscillations (vibration) under certain operational conditions. This most likely contributed to the high-cycle fatigue failure of the 41-tooth bevel gear.

Safety action taken

Eurocopter has issued the following two alert service bulletins to check for the proper adjustment of the torque dampening system on Unison starter-generators installed on the Eurocopter fleet of aircraft:

- AS 350 Alert Service Bulletin No. 80.00.07 Rev.0 dated 19 December 2008
- EC 130 Alert Service Bulletin No. 80A003 Rev.0 dated 19 December 2008

In July 2008, Turbomeca issued Service Bulletins (SB) No. 292 72 0325 and No. 292 72 2090 regarding, respectively, TU 325 modification for Arriel 1 and TU 90 modification for Arriel 2 engines. According to Turbomeca, the aim of these modifications, which introduce a 41-tooth bevel gear with a thickened rim, was to improve the tolerance of the 41-tooth bevel gear to dynamic stress caused by high or excessive levels of electrical power tapped from the generator. The application of the SB was as follows:

- systematic on the new engines for Sikorsky S76 and single-engine Eurocopter helicopters;
- at the operators' request for engines in service; and
- in case of replacement of the 41-tooth bevel gear during repair of module 01.

However, given the results of its investigations, Turbomeca has concluded that TU 90 and TU 325 do not resolve the last two occurrences of 41-tooth bevel gear failures or other situations where a starter-generator is installed with an incorrectly adjusted dampening system. Turbomeca can only confirm that the new design is at least as robust as the current design relative to abnormal vibration and torsional oscillation.

As well, the European Aviation Safety Agency has issued Airworthiness Directive (AD) 2009-0004 requiring mandatory compliance with the service bulletins.

TSB Final Report A08A0095—Engine Failure and Collision with Terrain

On July 14, 2008, a float-equipped de Havilland DHC-2 (Beaver) aircraft departed Crossroads Lake, N.L., at approximately 0:813 ADT with the pilot and six passengers on board. About three minutes after takeoff as the aircraft continued in the climb-out, the engine failed abruptly. When the engine failed, the aircraft was about 350 ft above ground with a ground speed of about 85 mph. The pilot initiated a left turn and, shortly after, the aircraft

crashed in a bog. The pilot and four of the occupants were seriously injured; two occupants received minor injuries. The aircraft was substantially damaged, but there was no post-impact fire. The impact forces activated the onboard emergency locator transmitter.



The damaged aircraft after the accident

Findings as to causes and contributing factors

1. The linkpin plugs had not been installed in the recently overhauled engine, causing inadequate lubrication to the linkpin bushings, increased heat, and eventually an abrupt engine failure.
2. Immediately following the engine failure, while the pilot manoeuvred the aircraft for a forced landing, the aircraft entered an aerodynamic stall at a height from which recovery was not possible.

Finding as to risk

1. The failure to utilize available shoulder harnesses increases the risk and severity of injury.

TSB Final Report A09C0017—Collision with Terrain at Takeoff

On February 4, 2009, a ski-equipped de Havilland DHC-6 Series 100 was taking off from a ski strip east of and parallel to Runway 36 at La Ronge, Sask. After the nose ski cleared the snow, the left wing rose and the aircraft veered to the right and the captain, who was the pilot flying, continued the takeoff. However, the right ski was still in contact with the snow. The aircraft became airborne briefly as it cleared a deep gully to the right of the runway. The aircraft remained in a steep right bank and the right wing contacted the snow-covered ground. The aircraft flew through a chain link fence and, at approximately 09:15 CST, crashed into trees surrounding the airport. The five passengers and two crew members evacuated the aircraft with minor injuries. There was a small fire near the right engine exhaust that was immediately extinguished by the crew.



Findings as to causes and contributing factors

1. Contamination on the wings of the aircraft was not fully removed before takeoff. It is likely that asymmetric contamination of the wings created a lift differential and a loss of lateral control.
2. Although the operator was not authorized for short takeoff and landing (STOL) takeoff on this aircraft, the crew conducted a STOL takeoff, which reduced the aircraft's safety margin relative to its stalling speed and minimum control speed.
3. As a result of the loss of lateral control, the slow STOL take-off speed, and the manipulation of the flaps, the aircraft did not remain airborne and veered right, colliding with obstacles beside the ski strip.

Findings as to risk

1. The out of phase task requirements regarding the engine vibration isolator assembly, as listed in the operator's maintenance schedule approval, results in a less than thorough inspection requirement, increasing the likelihood of fatigue cracks remaining undetected.
2. The right engine inboard and top engine mounts had pre-existing fatigue cracks, increasing the risk of catastrophic failure.

Other findings

1. The cockpit voice recorder (CVR) contained audio of a previous flight and was not in operation during the occurrence flight. Minimum equipment list (MEL) procedures for logbook entries and placarding were not followed.

2. The operator's safety management system (SMS) did not identify deviations from standard operating procedures.

Safety action taken

The operator has taken the following actions:

- All DHC-6 engine mounts have been inspected.
- The operator's inspection program has been amended to include the manufacturer's recommendation to overhaul or replace the engine mounts every 3 000 hr.
- Short take-off and landing (STOL) procedures have been suspended.

TSB Final Report A09Q0181—Fuel Starvation

On October 11, 2009, a privately operated Piper PA-34-200T took off from Saint-Georges Airport, Que., and was headed for Gatineau, Que., on an instrument flight plan. The aircraft was in cruising flight at an altitude of 10 000 ft and was 7.4 NM southwest of Mirabel Airport, Que., when both engines simultaneously lost power. The aircraft entered a 180° right turn. The pilot informed air traffic control that he was having engine problems but did not declare an emergency. Radar vectoring was provided to the pilot to direct him to Mirabel Airport. During the descent, the aircraft deviated southward before turning back toward the airport. The aircraft had insufficient altitude to glide to the airport and crashed in a maple bush 1.2 NM from the threshold of Runway 06 at Mirabel Airport at 17:32 EDT. The aircraft was located by a helicopter several minutes later. The pilot, who was the sole occupant of the aircraft, was seriously injured.

Findings as to causes and contributing factors

1. The right fuel selector was left in the XFEED position, probably because the pilot was distracted and/or failed to follow the checklist. As a result, both engines were being fuelled by the left tank until it was completely empty, causing both engines to stop simultaneously.
2. The pilot relied on a fuel quantity indicator system that was based on the engine's fuel consumption and not on the quantity of fuel remaining indicated by the gauges.
3. The pilot did not recognize the power loss as being a failure of both engines. The emergency checklist for engine failure was not completed.



Other findings

1. The aircraft's emergency locator transmitter (ELT) broadcast signals on 121.5 MHz and 406 MHz. The ELT was not damaged on impact, but its antenna was broken, making it difficult to capture signals.
2. The pilot did not declare an emergency and did not clearly indicate the nature of the problem; therefore air traffic control (ATC) could not anticipate his needs.

TSB Final Report A10Q0070—Collision with Terrain

On May 19, 2010, the pilot rented a Cessna 172 for a 2-hour period from 14:00 to 16:00, for a pleasure flight under visual flight rules from Québec City/Jean-Lesage International Airport to L'Isle-aux-Grues, Que. The aircraft was carrying the pilot and three passengers. At approximately 15:18 EDT, the aircraft made a touch-and-go on Runway 25 at L'Isle-aux-Grues airport. On the climb-out, the aircraft halted its climb and started flying around the island at low altitude. At 15:22, a quarter of a mile south of the runway, the aircraft struck a pile of rocks and earth in a field, then crashed and caught fire. The aircraft was partly destroyed by fire. The four occupants died as a result of the accident. The emergency locator transmitter (ELT) activated on impact; satellites received a signal a few seconds after the accident and Canada Search and Rescue was notified.

History of the flight following the touch-and-go

The Cessna halted its climb shortly after its touch-and-go on Runway 25 and continued flying at low altitude. It disappeared behind the trees on the western tip of the island, then proceeded east along the south shore of the

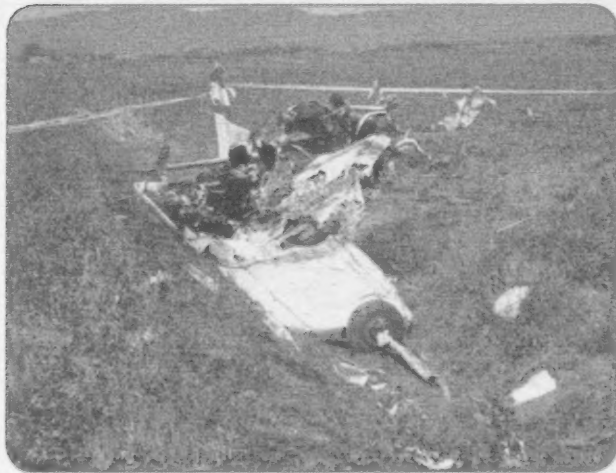
island about 200 ft above the ground. Abeam the airport, the aircraft turned left and headed northwest on a track perpendicular to the runway centre line. The aircraft overflowed a small wood then descended to a few feet above a field. The aircraft flew just above the ground for a distance of 350 ft before striking a mound of rocks and earth. The aircraft partly broke up and continued in the air until it struck the terrain and caught fire. The final impact was in a field about 255 ft from the mound. The pilot and two passengers were fatally injured. The other passenger died in hospital a few hours later.

Low-altitude flight

Flying at low altitude can be dangerous: the field of view is more limited and the background landscape can conceal obstructions if it does not provide sufficient contrast. In this occurrence, the low-altitude flight was made over a non built-up area and, in large part, over water. Just before ground impact, the aircraft overflowed a small wooded area at low altitude then descended to just above a cultivated field.

Section 602.14 of the *Canadian Aviation Regulations* (CARs) about low-altitude flight states, with regards to flight over a non built-up area:

Except where conducting a take-off, approach or landing or where permitted under section 602.15, no person shall operate an aircraft [...] at a distance less than 500 feet from any person, vessel, vehicle or structure.



Analysis

The accident occurred because the aircraft, while flying just above the ground, struck a mound 8 ft in height. Due to a lack of evidence, the investigation was unable to determine why the pilot stopped the climb after the touch-and-go landing and continued flying at low altitude. Nor could it be determined why the aircraft descended to a few feet above terrain, which was unsuitable for landing, just before the initial impact.

Two hypotheses may explain why the pilot made a low-altitude flight which, resulted in a collision with the terrain.

Technical deficiency with the aircraft

It is possible that, after encountering mechanical trouble, the pilot was attempting to make an emergency landing when the aircraft struck the mound. The elements that support this hypothesis are:

- the pilot was not known to fly at low altitude;
- the marks on the engine tachometer dial indicate that the engine was running between 1 800 rpm and 1 900 rpm at the time of impact, which is below the normal cruise power level;
- the pilot sent an unintelligible radio message shortly before the collision.

However, no mechanical deficiency which could have caused the engine to lose power or the aircraft to become uncontrollable in flight were noted or discovered prior to the flight or on examination of the aircraft. In fact, damage to the propeller indicates that the engine was producing power at the time of impact.

Based on the damage to the aircraft, the impact marks on the mound and the trajectory of the debris trail, the Cessna was configured for cruise flight and the pilot had control of the aircraft until the time of impact. The aircraft was flying at over 57 mph at the time of initial impact, the aircraft did not stall. The marks on the engine tachometer were made when the engine rpm decreased as a result of the propeller striking the ground.

Pleasure flight just above ground without intent to land

The aircraft occupants intended to land at L'Isle-aux-Grues airport for sightseeing. To that end, the pilot had rented the aircraft for 2 hr (from 14:00 to 16:00). But because the aircraft did not take off from Québec City until 14:47, it was impossible to make the stopover as planned and return on time. In fact, the pilot had less than 10 min to spend in the area before departing on the return leg. It is possible the pilot decided to overfly the island to give his passengers a view of the landscape from the air in lieu of stopping over; a low-altitude flight would have provided an exceptional view. None of these hypotheses could be proven with a degree of certainty.

It is likely the pilot was looking straight ahead while descending over the field. By extension, the pilot likely did not see the mound when the aircraft flared to level flight.

Finding as to causes and contributing factors

1. For undetermined reasons, the aircraft was flying low, just above the ground, when it struck an 8-foot mound in a field and crashed. Δ

ACCIDENT SYNOPSES

Note: The following accident synopses are Transportation Safety Board of Canada (TSB) Class 5 events, which occurred between February 1, 2011, and April 30, 2011. These occurrences do not meet the criteria of Classes 1 through 4, and are recorded by the TSB for possible safety analysis, statistical reporting, or archival purposes. The narratives may have been updated by the TSB since publication. For more information on any individual event, please contact the TSB.

— On February 3, 2011, a Bell 206B helicopter was harvesting pine cones and was descending to unload. At about 100 ft above ground, as the pilot was checking his descent and turning into wind, tail rotor authority was lost and the helicopter began to rotate. The main rotor contacted trees and the helicopter crashed on its left side. The pilot was the sole occupant and sustained minor injuries. He was transported to Peace River by ground ambulance. Winds were reported to have been from the northwest at about 5 to 10 kt. *TSB File A11W0018.*

— On February 4, 2011, a privately operated ski-equipped Piper PA20X (Pacer) was executing touch-and-go landings from Lake Otis, Que., with two people on board. After takeoff, the left ski struck a snow windrow and broke. The left wing touched the snow and the aircraft ground looped. No one was injured, but the propeller and fuselage sustained major damage. There was no fire following impact. *TSB File A11Q0027.*

— On February 8, 2011, a Found Brothers FBA-2C1 aircraft was on approach for Runway 34 at the Sioux Lookout airport. Immediately after touchdown, the aircraft veered to the left and then nosed down. The aircraft did not overturn and came to a rest in a nose down position on the runway. There were no injuries, but the aircraft was substantially damaged. The runway was closed for approximately 15 min to tow the aircraft off the runway. Runway conditions were bare and dry. Wind conditions at the time were 270° at 12 kt gusting to 17 kt. *TSB File A11C0016.*

— On February 9, 2011, an amateur built Van's RV-4 took off from Runway 13 at Courtenay Airpark, B.C. Shortly after takeoff, at about 50 ft altitude, the engine (Lycoming O-320D2A) stopped. The pilot headed straight ahead and landed hard along the shoreline. The main landing gear was damaged and the propeller struck the ground. The tide was low at the time and the aircraft was out of the water. The RCMP and fire crews responded. The aircraft was moved to keep it out of the water at high tide. The pilot observed a white crystalline substance in suspension when he dipped the tanks during an earlier stop at Port Alberni, and noted a relatively dark blue tint to the fuel from that location. The engine and fuel system will be examined further to assess any possible fuel blockage or contamination. *TSB File A11P0028.*

— On February 18, 2011, a Piper PA28-140 was landing on Runway 15 at Saskatoon John G. Diefenbaker International Airport, Saskatoon, Sask., following a local flight. The wind was 340° at 2 kt. The landing was flat, on all three wheels, and the aircraft began to steer to the side of the runway immediately after touchdown. Then the aircraft departed the other side of the runway and tipped nose down when it entered the snow. The propeller was damaged and the nose gear strut was bent. The pilot was uninjured. *TSB File A11C0024.*

— On February 22, 2011, a privately registered Cessna 310 was arriving in Peterborough, Ont., on a VFR flight from Goderich, Ont. Upon touchdown the nose wheel tire blew and after a strong shimmy, the aircraft came to a rest 700 ft down the runway. The nose wheel rim was damaged and several significant wrinkles were found on the fuselage area surrounding the nose gear. Both occupants were uninjured. *TSB File A11O0021.*

— On February 24, 2011, a Cessna U206G was conducting wildlife telemetry services in the vicinity of Wabasca, Alta. The pilot elected to land at the Buffalo Creek airstrip (abandoned) and during the landing, the aircraft encountered deep snow, resulting in both wing tips and the propeller contacting the ground. There was approximately 24 in. of snow on the airstrip. The aircraft's 406 ELT activated and the pilot also selected 911 on the SPOT. In addition, the aircraft was equipped with satellite tracking equipment, which gave the accident location to Alberta Sustainable Resources flight following centre. A helicopter associated with the wildlife operation retrieved the pilot within 30 min. The pilot sustained minor injuries and was transported to the medical facilities in Wabasca. There was substantial damage to fuselage and wings. *TSB File A11W0026.*

— On March 7, 2011 a Diamond DA40 aircraft was en route from Halifax, N.S. to Québec City, Que. While flying in American airspace over Maine, the aircraft encountered icing conditions and the pilot declared an emergency. The aircraft eventually descended below minimum vectoring altitude (MVA). After losing communications, the Montréal Centre attempted to reach the pilot via relay without success. Canadian and American search and rescue centres were then notified. The aircraft was located at 46°45'4"N, 069°5'3"W (Maine, U.S.) 2 mi. from the Que. border. The aircraft was

destroyed when it struck a hill. One occupant was fatally injured and the other had serious injuries. The U.S. NTSB is investigating and an Accredited Representative from the TSB has been appointed. *TSB File A11F0038*.

— On March 8, 2011, a ski-equipped Cessna 185 was on the take-off roll from a private airstrip at Scroggie Creek, Y.T., when control was lost and the aircraft departed the left side of the runway, crossing a ditch. The aircraft sustained substantial damage to the main landing gear, empennage and propeller. The pilot, who was the only person on board, was not injured. *TSB File A11W0034*.

— On March 8, 2011, a Eurocopter AS350 B2 helicopter was engaged in survey operations near Peller Lake, N.W.T. The flight was operating an altitude of approximately 150 ft AGL and following a survey line, which was near the snow covered surface of Pellet Lake. The flight encountered white-out conditions and the pilot lost visual reference with lake surface. Shortly afterward, the helicopter contacted the lake surface and rolled over. The pilot and 2 passengers were able to exit the helicopter without injuries; however, a post crash fire ensued, which destroyed most of the fuselage and all survival gear onboard. *TSB File A11C0038*.

— On March 13, 2011, a McDonnell Douglas 369D helicopter was landing at a remote well lease site approximately 15 NM south east of Conklin, Alta., to pick up a seismic crew. The sky conditions were clear, the visibility was good, and the winds were light to calm. The lease site was approximately the size of a football field; however, most of the surface within the cleared area was very rough and only the outer edges of the site, adjacent to the perimeter trees, were suitable for landing. On short final to the usual touchdown area, the pilot elected to change the touchdown point. As the helicopter was being manoeuvred towards the new touchdown point the tail rotor struck a large rock. The tail rotor drive shaft sheared and the tail rotor sustained substantial damage; however, the helicopter remained upright on landing. The pilot, who was the only occupant, was not injured. *TSB File A11W0037*.

— On March 15, 2011, a ski-equipped Piper PA-18-150 Super Cub took off from Lac des Trois Caribous, Que., using the packed snow of a skidoo trail. The destination was St-Mathieu de Beloeil (CSB3). The trail ran along the edge of the lake. Immediately after takeoff, the aircraft was carried off course to the right and crashed into the trees. It sustained major damage. The pilot, who was alone on board, was able to get out through the broken windshield and suffered only minor injuries. The emergency locator transmitter began transmitting a signal

on 406 MHz at 13:24 and it indicated the crash site at 13:30. *TSB File A11Q0054*.

— On March 20, 2011, a Rand-Kar advanced ultra-light had flown approximately 6 hr throughout the day. Approximately 5 NM from destination, the pilot realized that fuel was low. A precautionary landing was executed in a field. During the initial landing roll, the front skis hit a ditch made by a snowmobile. The front ski's strut collapsed, causing the aircraft to flip over. Neither of the two occupants was injured. The aircraft front ski and propeller were damaged. The aircraft has a fuel autonomy of 6 to 7 hr. *TSB File A11Q0057*.

— On March 29, 2011, a private Rockwell International Aero Commander 112 was to carry out a training flight with an instructor and a student pilot on board. The aircraft was getting ready to taxi when the landing gear alarm sounded. The instructor retracted the landing gear in order to resolve the problem. The nose wheel retracted and the aircraft fell onto its nose. The propeller, the engine, and the landing gear door sustained major damage. The instructor and student pilot were uninjured. *TSB File A11Q0062*.

— On April 1, 2011, a privately operated Cessna 177 was on a VFR flight from Claxton-Evans County Airport (KCWV) to Columbia Metropolitan Airport (KCAE) in the United States with two people on board. During a hard landing on Runway 29, the nosewheel collapsed and the propeller touched the surface of the runway. No one was injured, but the aircraft sustained major damage to the fuselage. *TSB File A11F0069*.

— On April 8, 2011, a Cessna 172S was returning to Cooking Lake airport from a solo training flight. The initial approach was attempted on Runway 28; however, winds appeared to favour Runway 10. An overshoot was completed and the student made a number of attempts to land on Runway 28 while encountering a strong crosswind. On the final attempt for landing on Runway 10, the student pilot lost control of the aircraft and veered to the left. The aircraft departed the runway at about the midpoint of the runway and collided with a snowbank. The aircraft flipped onto its back. The pilot was uninjured. *TSB File A11W0053*.

— On April 12, 2011, a privately registered Cessna 182 was parked in a drive-through hangar on a private airstrip near Williams Lake, B.C. A start was attempted and the propeller would not turn over. The master switch was turned off and the pilot attempted to turn the propeller by hand to loosen the oil. The magnetos were live, the throttle was at maximum, the mixture was rich, the

parking brake was off, and the chocks were out. When the propeller was turned, the engine started and the empty aircraft shot out of the hangar, skipped 400 ft attempting to fly and struck a berm. The pilot was not injured. The aircraft was substantially damaged. *TSB File A11P0067.*

— On April 19, 2011, a Cessna 310K was on an IFR flight from Toronto/Buttonville municipal airport (CYKZ), Ont., to Mirabel International Airport (CYMX), Que. When the aircraft was on short final, the control centre was notified of a problem with the front landing gear. The pilot confirmed his intention to land on Runway 06. Upon landing, the front landing gear folded and the aircraft slid along the runway before coming to a stop. No one was injured. The aircraft sustained damage to the nosewheel and two propellers. *TSB File A11Q0075.*

— On April 23, 2011, a Hughes 500 helicopter was spraying when it struck the top of a tree during a turn. The pilot's vision was affected by windshield glare from the rising sun. The lower chin bubble windshield was shattered and the mount for the anti-torque control pedals was broken. The helicopter landed without further incident. *TSB File A11P0081.*

— On April 24, 2011, a Cessna 210H was on final approach to Cochrane, Ont., when the right main landing gear failed to extend. The aircraft continued to land and touched down on the nose and left main landing gear. The aircraft came to rest on the right wing tip and right horizontal stabilizer. Maintenance found the right brake hydraulic line had moved away from the landing gear

strut and had caught in the release mechanism, preventing landing gear extension. *TSB File A11O0053.*

— On April 27, 2011, a Cessna 180 departed Vulcan, Alta. for Springhouse, B.C. with an ETA of 09:00 PDT. When the aircraft was reported late, the rescue co-ordination centre (RCC) was notified and a search was initiated. With the help of the Golden, B.C. RCMP detachment, an ELT 406 signal, "Spot Tracker" information, SAR aircraft, and a Parks Canada helicopter, the wreckage was located at 5 000 ft ASL in an area with a high risk of avalanche. There was no fire and the pilot sustained fatal injuries. The TSB has offered assistance to the Coroner. *TSB File A11P0077.*

— On April 30, 2011, a Beech BE24 Super Musketeer had just touched down and was taxiing to the aerodrome in St-Hyacinthe, Que., when the nosewheel collapsed and the aircraft left the runway. The aircraft was stationary for a while on the runway and it sustained major damage. The TSB is awaiting additional information. *TSB File A11Q0081.*

— On April 30, 2011, a Piper PA18 was waiting for the runway at the aerodrome in St-Hyacinthe, Que., to clear so that it could land. There was a Beech BE24 on the runway (*see report #A11Q0081 above*) whose nosewheel had collapsed while taxiing. The pilot of the Piper reported that his passenger was ill and that he had decided to land on the grass next to the runway. The Piper nosed over upon landing. The aircraft sustained major damage but no one was injured. *TSB File A11Q0082. Δ*

IMPORTANT NOTICE: The ASL is moving to the Web!

Starting with Issue 1/2012, Transport Canada's *Aviation Safety Letter* (ASL) will officially become an online publication only. The decision to end the printing and distribution of paper copies of the ASL was not taken lightly, and was made in order to reduce our environmental footprint and to better manage public funds.

The good news is that this transition offers new possibilities for our publication, such as unrestricted use of colours, length of magazine, interactivity, and exploring the use of social media. Safety awareness activities need to adapt to current industry trends to become as effective as possible. This shift moves us in the right direction and highlights Transport Canada's continual progression and growth in its safety awareness strategy.

Time to sign-up for the e-Bulletin!

Thousands of ASL readers have already made the transition to electronic delivery, and subscribe to our *e-Bulletin* notification service. We invite all others to do so, by visiting www.tc.gc.ca/ASL and follow the easy steps to be on our electronic mailing list. Once signed-up, you will receive an e-mail announcing the release of each new issue of the ASL, as well as a link to the main ASL Web page. For those that prefer a printed copy, you will be able to receive a print-on-demand version (black and white) through Transport Canada's Publication Order Desk at 1-888-830-4911 or by e-mail at MPS1@tc.gc.ca.

Transport Canada values the opinions of ASL readers and will soon issue a reader survey to collect ideas on enhancing the ASL. We look forward to welcoming you online at www.tc.gc.ca/ASL. **Δ**



False Representation and Entries

by Jean-François Mathieu, LL.B., Chief, Aviation Enforcement, Standards, Civil Aviation, Transport Canada

Aviation Enforcement has devoted many of its previous articles in this publication to information regarding the enforcement of the *Canadian Aviation Regulations* (CARs). The *Aeronautics Act* (AA) is the legislation that authorizes the creation of these regulations and also establishes specific and serious prohibitions and offences and the associated punishments for violations. The purpose of this article is to focus on subsection 7.3(1) of the AA, and specifically paragraphs 7.3(1)(a) and 7.3(1)(c) which, are very serious offences related to "False Representation" and "False Entries." Paragraph 7.3(1)(a) of the AA states: "No person shall knowingly make any false representation for the purpose of obtaining a Canadian aviation document or any privilege accorded thereby." Paragraph 7.3(1)(c) states: "No person shall make or cause to be made any false entry in a record required under this Part to be kept with intent to mislead or wilfully omit to make any entry in any such record." Offences in this subsection of the AA involve intent by the person, a deliberate act on the part of the offender to wilfully carry out an act or omission of an act.

In simple terms, we are referring to voluntary actions committed by a person that could be considered "fraud." The common understanding of "fraud" is dishonesty calculated for personal gain or advantage. Offences under 7.3(1)(a) and 7.3(1)(c) of the AA are two offences that have serious consequences, and a person who is found to be in contravention of these paragraphs is guilty of an indictable offence or an offence punishable on summary conviction. These offences could subject the person to a comprehensive investigation by Transport Canada, which may result in the person appearing in court. An individual who is convicted of this type of offence is punishable on summary conviction to a fine not exceeding \$5,000 or to imprisonment for a term not exceeding one year, or to both a fine and imprisonment. A corporation that is convicted of this type of offence is punishable on summary conviction to a fine not exceeding \$25,000. Aviation Enforcement also has the option of assessing a punitive suspension of a Canadian Aviation Document (CAD) rather than proceeding by summary conviction or indictment, and depending on the circumstances and other factors surrounding the offence, may take this course of action.

Many of the most recent cases surrounding 7.3(1) offences of the AA typically involve pilots, student pilots and aircraft maintenance engineers. Some pilots and student pilots have knowingly falsified flight records

and training records for the purpose of obtaining ratings or for upgrading licences. These individuals knowingly embellish their own flight times for the sake of simplicity or time constraints. A few pilots have also consciously made false declarations or have wilfully omitted critical information on their medical applications to hide certain medical facts. Some aircraft mechanics have purposely made false statements or declarations on their applications in the interest of obtaining a licence or rating. There have been some aircraft maintenance engineers that have signed another aircraft maintenance engineer's name in a maintenance release applicable to an independent inspection, when in fact the work was either not carried out or wasn't up to the applicable standard. Some corporations have also falsified training records for unqualified crew so they could carry out flight duties without going through the expense of qualifying them. These are all serious offences that were wilfully and knowingly carried out by the offenders for the purpose of obtaining some degree of personal gain or advantage.

While it may seem like a very innocuous and outwardly harmless act at the time, committing these fraudulent types of offences can, in fact, turn out to have very serious consequences down the road. Some of these consequences, upon conviction, can range from a record of the offence on the person's file, to imprisonment, fines, licence suspensions and even limitations to future employment opportunities.

Section 8.4 of the AA also stipulates that another person who has responsibility or influence over an individual who has committed an offence under 7.3(1) may also be proceeded against in respect of and found to have committed an offence under this section using the doctrine of vicarious liability.

The AA also requires, under section 7.31, that where the offence is committed or continued on more than one flight or segment of a flight, it shall be deemed to be a separate offence for each flight or segment of the flight. Therefore, multiple offences could be charged to a person for the sake of one act.

Aviation Enforcement has and will continue to rigorously investigate these serious allegations and determine the appropriate penalties that will deter others from embarking on this same path. Those few persons who elect to engage in these types of activities run the risk of not only

tarnishing their own personal records, but could possibly be limiting their future job opportunities and advancement, and consequently their incomes.

We recognize that voluntary compliance with the regulations is the most progressive and effective approach to aviation safety. Voluntary compliance is based on the idea that members of the aviation community have

a shared interest, commitment, and responsibility to aviation safety, and that they will operate on the basis of common sense, personal responsibility, and respect for others. When users fail to meet their obligations and contraventions occur, Aviation Enforcement is committed to enforcing the aeronautic legislation in Canada in a fair and firm manner. Δ

Tribunal Case Review: Responsibility of Crew to Determine Fuel Quantity in Tanks

by Beverlie Caminsky, Chief, Advisory and Appeals, Policy and Regulatory Services, Civil Aviation, Transport Canada

In a decision of the Transportation Appeal Tribunal of Canada (TATC), on March 28, 2008, the tribunal pointed out the importance of properly functioning flight equipment in an airplane. In the case discussed below, a Cessna 172, according to the aircraft owner's manual, was equipped with two (2) fuel tanks, one in each wing. The Minister of Transport's witnesses confirmed that, at the time of the infraction, the left fuel gauge in the airplane was unserviceable while the right fuel gauge was operational.

The Minister assessed a monetary penalty of \$750 against the pilot-in-command for a contravention of paragraph 605.14(j)(i) of the *Canadian Aviation Regulations* (CARs) which reads as follows:

605.14 No person shall conduct a take-off in a power driven aircraft for the purpose of day VFR flight unless it is equipped with

...

(j) a means for the flight crew, when seated at the flight controls to determine

(i) the fuel quantity in each main fuel tank.

The pilot-in-command had argued that there was only one fuel tank. His position was that the fuel system, as it appears in the owner's manual, does not include two fuel tanks but only one that is linked at the top and the bottom. The TATC Member, at the initial review hearing on January 28, 2008, determined that there were two (2) distinct fuel tanks, each one having its own gauge, which was clearly contained in the aircraft owner's manual, which described the FUEL SYSTEM. Neither the Minister of Transport, nor the pilot-in-command, had introduced an expert witness in the design and functioning of the aircraft's fuel tanks and fuel system. The TATC Member at the review level confirmed the \$750 monetary penalty saying that the pilot-in-command had contravened CAR 605.14(j)(i) because he had not been able to determine the quantity of fuel in one of the main fuel tanks.

The pilot-in-command appealed the Review Member's decision to the appeal panel of the Transportation Appeal Tribunal of Canada (TATC). He argued that the Review Member had relied on inaccurate information about the Cessna 172. The three (3) members of the appeal panel stated that, on the day of the infraction, it was not contested that one of the two fuel gauges was not operating. The appeal panel also stated that CAR 605.14(j)(i) sets out the necessity of having a fuel gauge that allows the quantity of fuel in each tank to be determined. The appeal panel concluded that the Review Member's findings of fact were reasonable and his decision was confirmed.

In this case the Cessna 172 was forced to execute an emergency landing on a busy street in the city, possibly because it had run out of fuel.

The pilot-in-command at the time of the forced landing held the position of operations manager, chief pilot and maintenance coordinator within the company which was the registered owner of the aircraft. Evidence was given by the Minister's witnesses, at the review hearing, that the left fuel gauge had been unserviceable for almost a year prior to the forced landing. One of the Minister's witnesses pointed out that, with only one working gauge, the flight crew could never know if the weight was unbalanced or if more fuel was coming from one wing. The pilot-in-command had plenty of time to take action to ensure that the left fuel gauge was repaired before he took off.

The importance of aviation safety for the protection of the public cannot be understated. It is crucial that an aircraft is in condition for safe operation, which it was not in the facts of this case.

In the case described above, even when the fuel tanks are linked at the top and bottom, the crew members must be able to determine the fuel quantity in each fuel tank. The flight crew, with an unserviceable left fuel gauge, could not ascertain how much fuel was in the left wing tank and allowing the aircraft to remain in service in that condition presented a hazard that was unacceptable. Δ

Three R44 Helicopters Fuelled with Jet Fuel!

This article is based on an Aviation Safety Advisory issued by the Transportation Safety Board of Canada (TSB), and TSB (Class 5) File A11Q0036.

On March 1, 2011, a privately owned Robinson R44 II helicopter with two people on board was on a VFR flight from Port-Menier, Que., to Jean-Lesage International Airport in Québec City, with a stopover at the Forestville airport, Que., for refuelling. The R44 II was accompanied by two other Robinson R44 IIs. During the stopover in Forestville, the three aircraft were erroneously refuelled with jet fuel (Jet A-1) rather than the required Aviation Gasoline (AVGAS) 100LL. During its initial climb, the R44 II lost engine power and the pilot made a forced landing in a residential neighbourhood in Forestville. Both people on board sustained minor injuries and were taken to hospital. The aircraft did not catch fire but it was heavily damaged. The two other aircraft landed near the same site and sustained no damage, although both necessitated an engine check.

When fuelling, the pilots were present and were helping the refueller, without ever noticing that the pump being used was for fuel type Jet A-1. The three pilots then each signed their individual fuel vouchers, which clearly specified that Jet A-1 fuel had been pumped into the fuel tanks. There are instructions on all three aircraft, by the tanks, outlining the maximum capacity of the tank and the type of fuel to use. These measures were not enough to prevent the error. It should be noted that the aircraft refueller was a new employee, who had only been there since December 2010, and his training was limited.

The fuel nozzle for Jet A-1 fuel in this instance had a 1 in. diameter, which is why the refueller was able to insert it into the AVGAS fuel filler opening of the three R44s.

While there are no fuel nozzle dimension standards for aircraft refuelling at Canadian airports, there are airworthiness standards for obtaining type approval and changes to type certificates for normal, utility, aerobatic, and commuter type aeroplanes. Section 523.973 of the *Canadian Aviation Regulations* (CARs) specifies that for aeroplanes with engines requiring gasoline as the only

permissible fuel, the inside diameter of the fuel filler opening must be no larger than 2.36 in., whereas for aeroplanes with turbine engines, the inside diameter of the fuel filler opening must be no smaller than 2.95 in. However, there is no standard for helicopters.

During the initial installation of equipment at aerodromes and airports, several gas and fuel providers equip refuelling stations with fuel nozzles of varying dimensions to avoid errors of this nature. Normally, the nozzles used for AVGAS have a 1 in. diameter, while the refuelling nozzles for Jet A-1 have a minimum 3 in. diameter. That way, even if the refueller makes a mistake in the selection of the appropriate fuel, the 3 in. refuelling nozzle cannot be inserted into the smaller fuel filler openings, which the majority of piston engine aeroplanes are equipped with.

The AVGAS-running Robinson R44 II is equipped with a 1.5 in. fuel filler opening, while the turbine-equipped Bell 206 helicopter has a fuel filler opening of 3.25 in. However, the Aerospatiale AS350 helicopter, which also runs on jet fuel, has a 2.28 in. fuel filler opening. Therefore in order to refuel an AS350 with Jet A-1, the 3 in. nozzle has to be modified or changed to a smaller nozzle. Considering that there are over 450 AS350 aircraft registered in Canada, it is feasible that several refuelling stations in Canada had to modify the fuel nozzles, just like at the Forestville airport, in order to accommodate these helicopters.

Similar events have occurred in the last few years, not only with helicopters but with aeroplanes equipped with piston engines. This latest event shows that despite the precautionary measures in place, it is still possible that the wrong fuel type will be pumped into aircraft fuel tanks. Fuel providers and refuelling stations are therefore reminded of the risks associated with fuel nozzle sizes and the importance of training refuellers accordingly. In closing, we also remind pilots to pay close attention to the fuelling of their aircraft with the proper fuel. Δ

2011 Flight Crew Recency Requirements Self-Paced Study Program

Refer to paragraph 421.05(2)(d) of the Canadian Aviation Regulations (CARs).

This questionnaire is for use from November 1, 2011, to October 31, 2012. Completion of this questionnaire satisfies the 24-month recurrent training program requirements of CAR 401.05(2)(a). It is to be retained by the pilot.

All pilots are to answer questions 1 to 29. In addition: aeroplane and ultra-light aeroplane pilots are to answer questions 30 and 31; glider pilots are to answer questions 32 and 33; gyroplane pilots are to answer question 34; helicopter pilots are to answer questions 35 and 36 and balloon pilots are to answer questions 37 and 38.

Note: Many answers may be found in the Transport Canada Aeronautical Information Manual (TC AIM).

TC AIM references are at the end of each question. Amendments to that publication may result in changes to answers or references, or both. The TC AIM is available online at:

www.tc.gc.ca/eng/civilaviation/publications/tp14371-menu-3092.htm

1. What is the SECURITAS Program? _____ (GEN 3.5)
2. VOR/VHF reception at an altitude of 1 500 ft AGL is about _____ NM. (COM 3.5)
3. Secondary surveillance radar (SSR) provides positive identification and aircraft altitude only when the aircraft has an _____. (COM 3.14)
4. The first transmission of a distress call should be made on the frequency _____. (COM 5.11)
5. All FICs provide _____ hour service and can be reached by dialling _____. (MET 1.3.2)
6. On a GFA "Clouds and Weather Chart", areas of showery or intermittent precipitation are shown as _____. (MET 3.3.11)
7. On a GFA "Clouds and Weather Chart", areas of obstruction to vision not associated with precipitation, where visibility is _____ SM or less, are enclosed by a _____. (MET 3.3.11)

TAF CYJT 041136Z 0412/0512 24010KT ½ SM -SHRA -DZ FG OVC002 TEMPO 0412/0413 3SM
BR OVC008 FM1300 29012G22KT P6SM SCT006 BKN015 BECMG 0422/0500 30010KT SCT020
RMK NXT FCST BY 18Z=

8. In the above TAF, what is the lowest forecast ceiling for CYJT? _____ (MET 3.9.3)
9. In the above TAF, at what time could you first expect to have VFR weather conditions in the CYJT control zone? _____ (MET 3.9.3, RAC 2.7.3)
10. "TEMPO" is only used on a TAF when the modified forecast condition is expected to last less than _____ in each instance. When the modified forecast is expected to last more than _____, either "_____" or "_____" must be used. (MET 3.9.3)
11. Are the winds in GFAs, TAFs, METARs and FDs given in degrees true or magnetic? _____ (MET 3.3.11; MET 3.9.3; MET 3.11; MET 3.15.3)
12. Why is a special weather report (SPECI) issued? _____ (MET 3.15.4)
13. A message that is intended to provide short-term warning of certain potentially hazardous weather phenomena is called a _____. (MET 3.18)
14. When using a dial-up remote communications outlet (DRCO), if a microphone is keyed more than _____ times, or _____, the system will not activate. (RAC 1.1.3)
15. Besides the *Designated Airspace Handbook*, where could you find out if certain airspace requires a transponder? _____
16. Which aircraft are not required to have a transponder in designated transponder airspace? _____ Transponder airspace includes all Class E airspace from _____ ft up to and including _____ ft ASL within radar coverage. (CARs 605.35, RAC 1.9.2)
17. According to the right of way regulations (CAR 602.19), where an aircraft is in flight or manoeuvring on the surface, the pilot-in-command of the aircraft shall give way to an aircraft that is _____. (RAC 1.10 & CAR 602.19)
18. To preserve the natural environment of national, provincial and municipal parks, reserves and refuges, and to minimize the disturbance to the natural habitat, overflights of these areas should not be conducted below _____. (RAC 1.14.5)



19. What is the minimum distance from cloud for aircraft flying VFR in uncontrolled airspace above 1 000 ft AGL? _____ (RAC Figure 2.7 & CAR 602.115)
20. A flight plan or flight itinerary shall be filed by sending, delivering or otherwise communicating it to the appropriate agency or person, and _____. (RAC 3.6.2 and CAR 602.75)
21. Find a copy of the *Canada Flight Supplement* and locate the "Planning" section (section C). In the "VFR Chart Updating Data", read the information on Conservation or Air Traffic Advisory Frequencies in your region of Canada. Record one of the topic names: _____ (*Canada Flight Supplement*)
22. For aeronautical charts covering the areas outside the more densely populated area, the topographic base maps are reviewed every _____ or _____ years and the aeronautical overlays are reviewed every _____ or _____ years. (MAP 2.3)

110052 CYUL MONTREAL/MASCOUCHE

CSK3 OBST LGT U/S TOWER 454352N 732712W (APRX 6 NM E AD)

205 FT AGL 245 MSL

TIL 1103212359.

23. The above NOTAM was in effect until _____. (MAP 5.6)
24. A summary of current Aeronautical Information Circulars (AIC) is kept up to date on the _____ Web site. (MAP 6.1)
25. Hand-held fire extinguishers using extinguishing agents having an Underwriter's Laboratories toxicity rating in Groups _____ should not be installed in aircraft. (AIR 1.4.1)
26. An altimeter setting that is too high results in an altimeter reading that is too _____. (AIR 1.5.3)
27. When flying near power lines, if the background landscape does not provide sufficient _____ you will not see a wire or cable. (AIR 2.4.1)
28. A pilot should not fly for at least _____ after donating blood. (AIR 3.12)
29. As per the Survival Advisory Information in TC AIM AIR Annex 1.0, what is the suggested equipment for providing signalling in your geographic area? _____ (AIR annexe 1.0)

AEROPLANE

30. A forward centre of gravity location will cause the stalling angle of attack to be reached at a _____ airspeed, while a rearward centre of gravity will cause the stalling angle of attack to be reached at a _____ airspeed. (Aeroplane references)
31. To achieve a turn of the smallest radius and greatest rate for a given angle of bank, fly at the _____ possible airspeed for the angle of bank. (Aeroplane references)

GLIDER

32. Frequency _____ MHz is allocated for the use of soaring activities. (COM 5.13.2)
33. The breaking strength of a glider tow rope must be more than _____% and less than _____% of the gross weight of the glider being towed. (Glider references)

GYROPLANE

34. When operating at low level into a strong head wind at a reduced airspeed, a 180° turn to fly downwind could be potentially dangerous because of the _____. (Gyroplane references)

HELICOPTER

35. Settling with power is most likely to occur due to poor management of the helicopter's _____. (Helicopter references)
36. What type of aerodynamic interference, which can result in a loss of tail rotor effectiveness, is most likely to occur when the wind is coming from a relative angle between 285° and 315°? _____. (Helicopter references)

BALLOON

37. When a balloon climbs from cold calm air through an inversion, what should the pilot expect in terms of performance? _____. (Balloon references)
38. The first action to stop an uncontrolled fuel leak or fire should be to _____. (Balloon references)